Alliance

Project Management Manual

SMACNA

NECA

MECHANICAL CONTRACTORS ASSOCIATION OF AMERICA

Alliance Project Management Manual

First Edition, March 1998

Alliance Project Management Manual

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INTRODUCTION

YOUR JOB AND THIS MANUAL

The project manager is the centerpin of every construction project. To the project team, he's the boss, the man with the power and the answers. To company officers, he's the eyes, ears and brain of the project; responsible for completing the work on time, according to specifications, and at a profit. To the project owner, general contractor, and other trades on the job, he is the contractor's ambassador, with authority to act on behalf of the company he represents. It is a job with many facets, a job that requires leadership, technical knowledge, sound judgment, common sense, sensitivity to people, excellent communications skills, and a knack for diplomacy.

Recognizing this, The Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) and The National Electrical Contractors Association (NECA) formed an Alliance to develop and publish this "Alliance Project Management Manual." The Mechanical Contractors Association of America, Inc. (MCAA) granted to the Alliance" permission to make specific revisions to their Project Manager's Manual and use it as a basis for the development of this manual. Most of the content of this manual is as published by MCAA in the third edition of their manual. The members of the Alliance Project Management Task Force wish to expressly thank MCAA for the use of the MCAA's Project Manager's Manual which greatly streamlined the development of the Alliance Manual for use by SMACNA and NECA members.

This first edition of the Alliance Project Management Manual is designed to help project managers, from different types of construction, meet all the varied responsibilities of their jobs. By itself, it's a compact source of general information on project management in the construction industry, offering tips for handling day-to-day situations and avoiding some of the most common pitfalls. When supplemented with your company's policies and procedures and specific information about your current projects, it becomes an indispensable tool for effectively managing your responsibilities, whether you're a veteran project manager or a newcomer to the job.

As you already know, good management relies on good communication and your success as a manager depends on your ability to communicate clearly and effectively. In a similar way, the success of this manual relies on its ability to communicate information to you and to other project managers throughout the industry. Therefore, if you have questions, comments, or suggestions about what the manual contains or how it's presented, the Alliance wants to hear from you. Your feedback plays an important role in making future editions of the Alliance Project Management Manual even more comprehensive and accurate than this one.

HOW TO USE THIS MANUAL

WHO THE MANUAL IS FOR

This Alliance Project Management Manual is for people who manage construction projects. Depending on your company's structure and the size of a given project, this may include project managers, job superintendents, working foremen or non-working foremen. In many cases, responsibilities are shared.

The manual is written as though most jobs have a designated project manager overseeing one or more foremen. The authors realize that other management configurations are common—on smaller projects, for example, the project manager may be the foreman as well—but selected one structure to maintain consistency throughout. Keep in mind that the number of people who share the management of a job is less important than getting the job done. Regardless of whether one person handles all the management tasks or a whole team does, the tasks are the same.

This manual describes those tasks. It gives you and your colleagues a relatively comprehensive list of the duties and considerations involved in planning and organizing a project and completing it efficiently, safely and profitably. In some cases, it may describe a method of management that varies from, or even contradicts, your company's established policies and procedures. Note these instances in the text and point them out to your company officers so that they can be resolved before your company puts this manual to work.

GENDER NOTE

Many competent men and women serve as project managers in the construction industry. In this manual, however, only masculine pronouns are used in reference to project managers and their duties. This convention is intended solely to avoid awkwardness in style and in no way reflects sexual bias on the part of the authors.

WHAT THE MANUAL CONTAINS

The Alliance Project Management Manual contains two types of information:

- General information on the responsibilities every project manager faces on the job, regardless of the company he works for, and
- Specific information on your company's particular policies and procedures.

The general information reflects both the experience of men and women who have successfully managed construction projects throughout the country and the research of industry experts.

Your company must supply the specific information. There is room in this binder for at least the most important of your company's policies on such things as job cost reports, change orders, scheduling, labor relations and safety. There is also room for information on the specific project you're working on—a project organization chart, a project schedule, contact information for project personnel, contract information, etc.

As mentioned earlier, your company's policies and procedures, or a situation on a particular job might conflict with the general information in the manual. If you find a conflict, report it to your company officers. When the conflict is resolved, revise the manual accordingly.

HOW THE MANUAL IS ORGANIZED

The manual is divided into sections, each section discussing a different topic. The sections are arranged in chronological order, generally addressing topics as they would be encountered on a project.

Within each section, general information is presented in both paragraph and outline form. The outlines can be used as checklists to help you plan and keep track of your overall and day-to-day responsibilities. Specific information on your company's policies and procedures should be in the form established by your company.

HOW TO LOCATE INFORMATION IN THE MANUAL

There are two ways to locate information in the manual:

- The tab dividers that separate the sections, or
- The Table of Contents in the front of this manual

Tab Dividers

Each tab divider is labeled with the section topic it marks. In some cases, you may not be sure which section contains the information you're looking for. For example, you may want information on back charges. Since there is no section entitled "Back Charges," you will have to check the Table of Contents.

Table of Contents

The Table of Contents tells you not only the topic of each section but the sub-topics as well. By scanning the Table of Contents you will likely find the section (and page) that contains the information you want.

GETTING STARTED

Take a few minutes now to browse through the manual and familiarize yourself with the layout. Pay particular attention to the Table of Contents. Then look over a couple of sections to see how the information is organized.

Next, read each section carefully. Note any points that may be unfamiliar to you. If you find any items that are not clearly explained, or that conflict with one another, bring them to the attention of your company officers. If necessary, arrange a special meeting where you, the company officers and any other interested company personnel can openly discuss the manual and its contents.

PUTTING THE MANUAL TO WORK

The Alliance Project Management Manual is a working resource, not a textbook. Don't simply put it on a shelf in your office and forget about it. Use it. It will save you time and effort and prevent your having to search in half a dozen places to track down the answer when you have a question. It will make you more knowledgeable and, because knowledge is a basic part of leadership, will make you a more confident leader, as well.

Consider also using the manual as a learning tool in a project manager's meeting. Several contractors have had success by covering a couple of chapters each week at their project manager's meetings. By going over the sections and discussing how your firm operates in these areas, project managers can share information and standardize how your firm is currently handling the project management process.

You are welcome to photocopy any of the forms found in the manual and use them as a part of your management routine. You are also encouraged to modify the forms to meet your own particular needs.

KEEPING THE MANUAL UP-TO-DATE

As the construction industry changes, your company's policies and procedures and your style of working should also change. Incorporate those changes into the manual. Insert into the proper sections any memos or updated policy statements issued by your company. Do this as soon as you receive them, and immediately remove any outdated manual pages as your company instructs.

Just as important, feel free to add to the manual any personal observations you have and any lessons you learn on a job. There's no better way to improve your own performance than to keep track of your experiences.

Finally, share your observations and experiences with us by sending them to The Alliance for Project Management.

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CHAPTER 1 QUALIFICATIONS FOR AND GENERAL RESPONSIBLITIES OF THE JOB

NOTES

WHAT IS A PROJECT MANAGER?

A project manager is the person responsible for doing, or having done, everything required for the company to earn the maximum fair profit on each project. This might seem an overly broad statement, but, in fact, accurately describes the scope of the project manager's duties.

In the course of research for this manual, dozens of specialty contracting company officers were interviewed for their views on the role and the importance of the project manager within their organizations. Without exception, all those interviewed agreed that the project manager is the single most important individual in their companies. The reasons are clear. He is the one person with complete understanding of, and authority for, the project. He is the link between the company and the market. His performance directly affects not only the profits from a particular job but the overall financial health of the organization.

A project manager's job is not terribly complicated, but it carries with it enormous responsibilities and it demands a unique blend of skills, knowledge and personality traits.

SPECIFIC RESPONSIBILITIES

A project manager's responsibilities fall into three general categories: resource management, team coordination, and liaison activities.

Resource management involves planning, organizing, scheduling and efficiently using:

- Labor
- Subcontractors
- Materials
- Time
- Installed equipment
- Budgets
- Construction equipment, and
- Company money and investments.

It begins with viewing these resources as pieces of the same complex jigsaw puzzle and then drawing on experience and technical knowledge to make them fit together as snugly as possible. A project manager who masters his resources in such a way that he virtually eliminates wasted time and cost can almost be certain that his projects will turn a fair profit.

Team coordination focuses on planning and scheduling project activities among three groups: field crews, shop crews and office personnel. Here communications skills are essential, because coordination relies on everyone involved understanding both the scope of the project and his role in it. Here, too, is the test of a project manager's sensitivity, to people and situations, and his ability to adjust to changing circumstances. Team coordination is absolutely crucial to the success of a project, and it is an area where personalities, competition or hostility among the three groups, in addition to unforeseen events, can play havoc if the project manager is caught unaware.

Liaison activities are the area where the project manager is both his company's ambassador and diplomat to many individuals and groups, including:

- Project owners
- Architects and engineers
- General contractors
- Construction managers
- Labor
- Subcontractors

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- Other trades
- Suppliers and manufacturers
- Federal, state and local authorities, and
- Media and the public.

In this role, the project manager has to have a clear vision not only of his goals for the project, but also his company's goals within the construction market. He has to be sensitive to the relationships among the various individuals and organizations involved in the project. He has to know when to push and when to pull, when to stand firm and when to compromise. Like team coordination, the project manager's liaison responsibilities require uncanny perception and judgment, as well as exceptional communications skills.

THE SKILLS YOU NEED

The skills a project manager needs depend on the structure of the company he works for, the types and organization of his projects, and the abilities and duties of the other members of the project team. Company executives throughout the construction industry agree, however, that certain skills are required for success in almost any project management role. Among those that industry leaders identify most often are:

- Sound judgment
- Ability to communicate ideas
- Self-discipline
- Leadership
- Foresight
- Ability to handle several tasks simultaneously
- Business sense
- Attention to detail
- Diplomacy
- Basic math
- Good reading and writing skills
- Technical skills
- Tendency to listen, and
- Inclination to gather information and weigh options before acting.

Within each of these skills is a set of secondary skills that are equally important. For example, leadership includes the ability to assess other people's personalities and feelings and determine which approach to use in handling a given situation. Business sense includes a talent for balancing quality and costs to ensure that the customer gets a satisfactory product and the company earns a fair profit.

WHAT YOU NEED TO KNOW

Skill and knowledge go hand-in-hand. Skill provides the ability to achieve something; knowledge provides direction—information about what must be achieved and how. The knowledge areas that company executives most often identify as essential for every project manager are:

- Technical knowledge of mechanical/electrical systems
- Technical knowledge of construction methods
- Understanding of how the construction industry operates
- Understanding of the company's goals and operating procedures
- A working knowledge of people, and
- Basic methods of effective leadership.

These knowledge areas are interrelated. For example, it is impossible to separate knowledge of construction methods from knowledge of how to deal with people in the construction industry.

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Likewise, it is difficult to appreciate why a company does what it does without seeing that company in the context of the construction market.

Like project management skills, project management knowledge can be learned. Not only that, the skills and knowledge should be expanded continually, because the industry changes so quickly that what a project manager knows and relies on today is likely to be outdated the week after next

WHAT CEO'S LOOK FOR IN A PROJECT MANAGER

Hiring a project manager, or promoting someone within the company to the post of project manager, is not an easy decision for any CEO (Chief Executive Officer). It always involves risk—the risk of entrusting millions of dollars of company resources, even the future of the company itself, to an individual who is oftentimes a virtual stranger. A good decision can mean a dramatic improvement in the entire company's performance. An error can literally lead to bankruptcy.

To minimize the risk involved in selecting a project manager, many specialty-contracting executives look for specific traits in job candidates. Specifically, they look for individuals who are:

- Profit oriented
- Able to communicate clearly and succinctly
- Self-motivated
- Aggressive
- Disciplined
- Pushed by a sense of urgency (and lacking the tendency to procrastinate)
- Analytical and attentive to details
- Methodical and organized
- Confident
- Personable
- Sensitive to people and situations
- Responsible
- Consistent in their performance and their dealings with people
- Enthusiastic
- Persistent
- Able to cope well with stress, and
- Educated both formally and through field experience.

If you're a project manager, someone with authority decided somewhere along the line that you either have these traits or the capability to develop them. That in itself is an indication of your company's confidence in you. To justify that confidence, review this list of traits regularly. Make a note of those that might not be as strong as they could be, and make an effort to strengthen them. By building up these traits in yourself, you'll not only help ensure your success as a project manager but in your personal life as well.

CHAPTER 2 PROJECT ADMINISTRATION

NOTES

PLAYING "CATCH-UP"

A typical project manager spends up to 70 percent of his time reacting to minor emergencies, correcting errors, tracking down answers to simple questions, and explaining the obvious. On a six month project (based on a 40-hour workweek), this translates into more than 700 hours of playing "catch up"—hardly a productive, or effective, use of a professional manager's time.

If, at the beginning of the project, that same project manager spent 40 hours on project administration, he could cut that 700 hours in half or better.

WHAT IS PROJECT ADMINISTRATION?

Administration is management. It is a system for controlling project elements and situations to your advantage.

Despite grumbling to the contrary, project administration does have a purpose other than saddling everyone on the job with rules and filling every free hour in the project team's schedule with paperwork. Project administration's purpose is simple: increase job productivity by establishing proactive rather than reactive management methods.

In plain English, effective administration provides a system that actively anticipates and prevents potential problems, saving everyone on the project team from having to react to one unforeseen incident after another. On a poorly organized project, people spend as much time "putting out brush fires" as they do on installing systems. Since a company earns its money based on the amount of productive work it does each day—not on the number of its own internal problems it straightens out—it's hardly surprising that so many unorganized projects lose money.

GOOD VS. BAD ADMINISTRATIVE SYSTEMS

A person who sees administration as an obstacle to getting productive work done has never worked within an effective administrative system. Good project administration clears obstacles out of the project team's way. It resolves all the details before work begins and gives everyone on the job a formula to follow in every given situation. As a result, no one has to wonder what to do when something unforeseen occurs, and everyone gets more productive work done with fewer distractions and headaches and in a shorter time.

Where an administrative system often goes wrong is in losing its focus. Administration is a tool, not an end in itself. It is goal-oriented. Its purpose is not merely to organize but to organize the project effort toward the specific goal of getting the work done on time and at a profit.

If the project manager starts by setting detailed project objectives and then designs policies and procedures that directly relate and contribute to achieving those objectives, the administrative system will prove his best ally. If, on the other hand, he ignores the fact that each project has its own unique objectives and "personality" and attempts (usually in order to save time and effort) to impose on today's project the same administrative system he used on yesterday's, he'll eventually find the system working against him. Within the first few weeks, everyone on the project team will recognize that the system doesn't match the project—necessary details are missing and some procedures seem to have no purpose at all. What was intended to eliminate problems and distractions suddenly becomes the project's biggest problem and most persistent distraction.

This is not to say that policies and procedures that worked on one project will not work on another. The vast majority will. However, to avoid problems the project manager has to approach each job from scratch. He has to review each policy and procedure through fresh eyes and from the point of view of the project's objectives, select appropriate existing policies, discard others, and create new rules to fit the situation.

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THE PROJECT MANAGER'S RESPONSIBILITIES

Essentially, the project manager has three general responsibilities in the area of project administration:

- Establish an effective, goal-oriented system of procedures right from the first day of the project
- Maintain the project team's adherence to the system throughout the project, and
- Monitor the effectiveness of his procedures continually and modify them as necessary to ensure that they contribute to, and do not hinder, the project effort.

Within these three general responsibilities are many specific responsibilities related to organizing the goals and elements of an administrative system. Some are listed below. All are discussed in detail in the appropriate sections of this manual.

GOALS OF AN ADMINISTRATIVE SYSTEM

An administrative system must be goal-oriented. In general the goals of any administrative system are:

- Organize and direct the efforts of the project team for maximum fair profit by:
  - Breaking down the project into achievable, trackable tasks
  - Assigning specific responsibilities to individuals
  - Establishing a chain of command, and
  - Ensuring that everyone always has the information, tools, materials, manpower and cooperation he needs to do his job
- Establish a network for communications among all members of the project team and between the project team and the other parties involved in the project—the project owner, general contractor, engineer, architect, subcontractors, inspection agencies, etc.—by:
  - Identifying who should be talking to whom, and
  - Providing channels for communication, including reporting and feedback systems, and a schedule of regular meetings
- Devise and implement work methods that maximize productivity at all levels by:
  - Applying the most productive methods for prefabrication and material handling
  - Employing labor- and time-saving tools and techniques
  - Properly managing project resources—labor, materials, equipment to be installed, tools and construction equipment and subcontractors, and
  - Coordinating specialty construction activities with the general contractor, the construction manager and the other trades on the job
- Monitor and document job progress and events by:
  - Implementing a practical, simple monitoring system that keeps the team apprised of all job situations, helps avoid surprises, and brings the entire team's talents and points of view to bear in solving problems
  - Using the job's history and present status to forecast project outcome and make adjustments to the project strategy, and
  - Establishing strict procedures for completing all documentation required to fulfill the contract and to provide the company with detailed job records for planning future jobs and substantiating its position in the event of a claim
- Instill a proactive, rather than reactive, style of management by:
  - Making everyone on the construction team profit-conscious
  - Encouraging team ingenuity and imagination
  - Looking for and taking advantage of profitable opportunities, and
  - Anticipating project events and situations, both good and bad

For an administrative system to work, these goals must be applied consistently to every area of the project.

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ELEMENTS OF AN ADMINISTRATIVE SYSTEM

There are only five basic elements in any construction project:

- Equipment to be installed
- Materials
- Labor
- Subcontractors, and
- Construction equipment and tools.

However, each element requires its own set of policies and procedures. Refer to the appropriate sections of this manual for detailed information on each of these elements.

CONCLUSION

The beginning of good project management lies in structuring the project to your own advantage right from the start. Project administration is that structure, and by establishing it early on, you give yourself a solid management foundation. You also provide everyone else on the team with a clear idea of what you expect, specific details on how you want things done, and organized, responsive channels for exchanging information, contributing suggestions, and airing complaints.

When used properly, good procedures enhance communication, cooperation and team spirit. When used inappropriately, they become burdens, obstacles and sources of resentment. Make your project procedures a means for enhancing participation, cooperation and imagination among team members, not rules and regulations for controlling and limiting them.

CHAPTER 3 MANAGING MULTIPLE PROJECTS

NOTES

The world of managing multiple projects usually requires 50-60 hours per week and is full of instant changes, stress, tensions, delays, and uncontrollable events. Usually the project manager is handling multiple projects, all in various stages of completion. The challenge the project manager faces is to manage all of them to a successful, profitable conclusion. Achieving this is a very rewarding experience.

It is very easy for the project manager to fall into the mode of managing by crisis, spending all day, every day, in putting out the fires as they come in on the cell phone. This is known as "reactive" management style—reacting to emergencies as they arise. This style results in neglecting many very important activities that need to be done, but do not fall in the category of being urgent. The preferred management style is one in which a project manager is "proactive"—anticipating problems and addressing them, as they become issues.

How does a project manager change from a "reactive" to "proactive" management style? The simple answer is this: each project must be managed more efficiently and effectively. How to do this is difficult and complex, involving changing how we manage projects and our personal time. The next several sections identify a series of problems and suggest possible solutions that can help the project manager move from being reactive to proactive through leadership, motivation, communication, and direction.

PERSONAL TIME MANAGEMENT

Problems

- Deviations from game plans
- Not enough time to manage site labor
- Effective motivation and communication with many different types of people
- Loss of team concept when problems arise
- Too many meetings
- Too much paper work
- Lack of adequate support in having people to handle the routine items

Suggestions

- Use a monthly and weekly planning calendar. When planning your days never plan to use all the time in each day with known work items. Reserve at least two hours of each day to handle unknown activities that will occur.
- Learn to say no to requests that have little value.
- Delegate repetitive items such as routine paper work, some telephone calls, some letters, expediting materials and equipment, and transmittals. If this kind of help is not available, discuss the problem with your supervisor.
- Uniformly use standard forms, procedures, and checklists on all projects. Remember, project forms and check lists must be kept updated at all times.
- Many times you are asked to attend long meetings in which your need to be present for subjects of interest are covered in only a few minutes. If this occurs, you may want to talk to the person conducting the meeting to see if you can be excused from the meeting during discussions covering subjects of no interest to you, or if you can meet separately to cover your subjects.
- Effectively use a personal notebook computer to reduce paper work and save time.
- Learn to delegate, as appropriate, work to your field supervisor. Then give him the guidance he needs to succeed. This will help him to grow and carry more of your load.
- Conduct effective "kick-off meetings" (see Chapter 5). This initial meeting is very important, but is not urgent, and is sometimes neglected. Therefore, you must force yourself to prepare well, schedule the meeting and conduct it as scheduled.
- Schedule your activities so that you spend real time at each job site to help the field supervisor manage the field labor and to maintain a dialog with the owner/general contractor.

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- Justify all requests that you make to your supervisor with a cost or quality improvement.
- Avoid some problems through a system called "Project Anticipation." This is a process that should occur at the kick-off meeting and involve the entire team. The project is reviewed to determine what problems are likely to happen during the course of the project. Once the problems have been identified, determine the actions necessary to prevent the problem, and if these actions do not succeed, what alternatives will be executed to minimize the impact on cost and schedule. This allows you to manage the problem without it becoming a crisis.

THIRD PARTY DELAYS AND SCHEDULE CHANGES

Problems

- The owner's completion date does not change, even though there are significant third party delays. This often results in over-manning, overtime, or remobilization, without compensation from the owner/general contractor.
- The general contractor makes schedules without input from the trade contractors and commitments are made in the form of an overall schedule.
- Delays in the schedule significantly impact manpower loading.
- Late delivery of materials or equipment.

Suggestions

Many of these delay problems are related to the owner/general contractor. The following apply to these areas:

- Submit, along with your bid, the schedule you used as a basis for your bid. A deviation from your bid schedule is a reason for reviewing your job costs and submitting a change order for your increased costs (see Chapter 14). This same procedure should be used for any schedule change imposed on your contract work.
- Consider submitting a change for your increased costs any time you have to change your manpower loading, whether or not your schedule is impeded.
- Record all delays, why it occurred, and its impact on your job plan. Recording these delays in the Foreman's Daily Log (see Figure 27-1) is the best means of reordering delays.
- Utilize good short interval planning to minimize the cost impact of delays.
- Take a proactive management approach and discuss impending problems with other trades or the general contractor before the delay occurs. Many times alternate plans can be developed to minimize the impact on your work.
- Taking a proactive approach can usually solve late delivery of materials or equipment. Critical orders, either placed by the owner or by your company, need to be expedited by telephone, FAX, email, or personal visits to the supplier. Most owners will welcome your assistance in maintaining the project schedule in this way.

DRAWING AND SPECIFICATIONS

Problems

- Bid documents are incomplete and inaccurate and the contractor is expected to take care of these problems as a part of bidding the job.
- Space limitations and interferences are usually not discovered until field erection is in progress.
- Design firms are very slow in reviewing and returning equipment drawings, shop drawings, and Requests for Information (RFI's).

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Suggestions

- Design drawing and specification problems should be referred to the responsible entity as soon as possible, giving a date when the response is required to prevent cost and schedule problems. If this does not work, you should consult with your manager.
- Identify and resolve problems before field erection begins. Requests for solutions may be made verbally, but must also be put in writing in a Request for Information. This RFI should also include the response need date required to prevent cost and schedule problems (see Figure 24-3).
- Equipment drawings that need review and approval by the design firm should be transmitted by a written transmittal that clearly states the required need date for approval (see Figure 24-5).

OTHER GENERAL PROBLEMS

- Labor costs are the most volatile of cost items to be controlled by the project manager. They are often neglected because, though very important, they are not as urgent as fighting fires. Here again, as project manager, you must force yourself to review project labor cost trends weekly or bi-weekly in the early stages of the project. As the project progresses, less frequent reviews may be appropriate, unless some problem in labor cost indicates the need to continue the weekly reviews.
- Construction is a people business. The project must deal with all types of people, from many different backgrounds, and must do it successfully, if project objectives are to be achieved. One of the primary responsibilities of the project manager is to understand each individual, determine how to motivate him, and work together in an agreeable manner. This will not happen unless you take time to study each individual and work at developing a good relationship.
- Sometimes your boss or your company's CEO may require too much time and effort on your part for things that decrease your ability to manage your projects. The best solution is usually the direct approach of meeting together and openly discussing the problem. Your boss and your CEO have a common objective with you—to achieve the desired profit on each job.
- What is the upper limit of how many projects a project manager should handle at a time? A question often asked, but rarely answered. It is very difficult to answer because of the many variables that impact the question. Some of these are: the experience and ability of the project manager, the size and nature of the projects, the location of the projects, the general contractor, and owner involved, to name a few.

CONCLUSION

There are many suggestions contained in this chapter that can be beneficial to help project managers handle multiple projects. There is no simple easy answer; however, the bottom line is

Success In Handling Multiple Projects Is Achieved By Managing Each Project Effectively, Efficiently, And With Enthusiasm.

CHAPTER 4 STAFFING

NOTES

THE IMPORTANCE OF PEOPLE

A construction project is a thoroughly human activity. It's designed by people, built by people, and managed by people. It provides employment for individuals and profits for companies, and in the end, gives the people of the community a facility to use in their daily lives.

At every step, the success of a project lies with the people involved in it. Nothing happens by sheer accident. If something goes right, it is because the people responsible made it right. If something goes wrong, it is because somewhere along the line someone or some group made a mistake.

Consequently, for the contractor to perform his part in a construction project and earn the maximum fair profit, he has to fill his company with people who have the skills, tools, and attitudes to make things go right. When it comes to staffing a project, the project manager has the same requirements. It is the starting point for success.

THE GOALS OF STAFFING

The goals of staffing a project team are identical to the goals involved in creating a basketball or football team:

- Assign the right number of people to the job so that every position is filled
- Assign each player to the position he plays best
- Assign responsibilities to each person on the basis of combined skills, abilities, and attitude
- Design the team so that each person's weakness is balanced by another's strength; aim for a group whose individual skills complement one another, and
- Create a real team where people think and work well together; avoid a group where one superstar dominates and everyone else is secondary.

If a project manager had a blank check and the freedom to choose his team members from anywhere in the construction industry, he would have little problem putting together a team that fulfilled these criteria. He could assemble an all-star team for every project. Unfortunately, this is the real world, and like a professional sports coach, he has to create the best team he can given the resources and people who are available. This sometimes makes staffing a difficult job.

STAFFING IN THE REAL WORLD

Take, for example, a situation where the company is about to start a $200,000 job in a local hospital. The project includes working in active areas of the building—near operating rooms and intensive care units—so strict control of dust, fumes, noise, and traffic is essential. Hospital utility service can't be interrupted except for short periods and at odd hours. Access to many areas is restricted. The hospital administrator had a bad experience with the mechanical contractor on the last construction project, and the general contractor has a reputation as difficult to get along with.

The company has a terrific foreman with lots of hospital experience, but he's tied up on another project for the next eight months. There's another guy who's fairly well qualified for this kind of job. He has a proven track record, but he and the general contractor do not get along. The only other available foreman is a new guy. He's supervised only two small jobs. Still, he's a quick study, he listens, and he gets along well with everyone—except the company's purchasing agent.

This example probably isn't too far removed from the type of staffing decisions you face regularly, and it points out the breed of dilemma that can make staffing so difficult—a dilemma complicated by the fact that $200,000 and months of work hang on your decision.

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Keep in mind that staffing goes beyond the job supervisor and foreman positions. In some cases it includes warehouse supervisors, shop foremen, on-site clerks and bookkeepers, and home office support personnel to manage scheduling, estimating, payroll, accounting, correspondence, and purchasing.

A SET OF PROVEN PROCEDURES

The best approach to staffing is to establish and follow a set procedure. Among the many contracting companies, the procedure, which has brought the most success in staffing project teams, is something along these lines:

- Create a chart that shows all the functions the project team must perform in order to manage the job successfully
- Using the chart of management functions as a guideline, develop a project team organization chart that assigns specific functions to individual team members
- Review a combination of the skills, abilities, and attitudes of each team member assigned and, assign responsibilities that match their capabilities
- Modify the project function organization chart to match the people assigned, making sure that all management functions on the original project function chart are addressed
- Assign specific responsibilities and authority to each team member, and
- Confirm that all functions and responsibilities involved in the project are covered.

Notice that the procedure starts by identifying functions—to be performed. It then assigns those functions to various team positions. The advantage is that each position is defined and described by its functions and responsibilities, giving the project manager and the team a clear and objective idea of the roll that each team member plays.

The Management Function Chart

A management function chart shows relationships among functions and responsibilities (and, in the case of the project team organization chart, the relationships among people). It shows the chain of command and the channels of communication—and therefore shows which members of the team will work together closely and must be compatible.

Second, because the chart is function-oriented, if it is accurate and complete it reflects the nature of the project itself. Is the project large or small? What other trades are involved? Is the client a government agency, an institution, an industry, or a commercial corporation? What is special about the job? Does it involve working in a restricted environment (a clean room or a hospital) or under strict regulations (as in a nuclear power plant)? The effect of all of these elements becomes apparent on the chart, because each affects the type of functions involved in doing the work. Consequently, no two function charts are ever identical.

Third, because the management function chart shows the relationships among the various functions, it provides a strategy for assigning them to specific team members. Using the chart, the project manager can readily see which functions should be grouped together. As a result, he can assign each member on the team, in agreement with the member's capabilities, a closely related group of functions instead of a haphazard collection of unrelated responsibilities.

Project Team Organizational Chart

Once the project manager identifies the various management functions involved in the project and groups them under individual team members, he should prepare an organizational chart. As Figure 10-1 shows, this chart shows the various positions on the project team and their relationship to one another. It is an invaluable tool for illustrating the chain of command, visualizing which individuals on the team must cooperate most closely and establishing necessary lines of communication.

Job Descriptions

Sometimes on large projects of long duration it may be advantageous for the project manager to design job descriptions for each position on the project team, based on how the job is organized. Some companies resist issuing job descriptions because they fear that employees will hide

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behind them, refusing to do anything or assume any responsibilities not listed. It seems that these companies don't trust their employees, and in return, probably aren't trusted by them either. This is a dangerous situation in any business, but especially the construction business, where employees are trusted with millions of dollars of company assets, resources, and potential profits.

Even considering the fact that some employees might abuse their job descriptions, a good job description is an invaluable management tool. It gives the project manager a clear and accurate description of the position to be filled and therefore a basis for evaluating the individual's performance. It gives each job candidate a clear picture of his or her job.

An accurate, specific job description should be developed for each team member. Each individual on the team should be aware of his job description, particularly:

- Specific task(s) to be performed
- Detailed working procedures
- A statement as to whom the individual is responsible
- A list of personnel from whom the individual will receive directions, and
- A definition of job responsibilities.

Team and Adjustment

Assembling an effective project team is not a matter merely of taking the people available and from your function organization chart giving each one a title and a list of responsibilities. The project manager has to balance qualifications such as experience and skills against such factors as individual attitudes and the potential for personality conflicts.

More than likely, when a project is assigned to him, the project manager finds that everything doesn't fit together as originally planned. Some individuals are more qualified than expected others less so. One or two might show a knack for combining functions that are under separate positions on the original function chart. The bottom line is that, before making final assignments the project manager should adjust the management function chart, the project team organization chart, and the individual job descriptions to reflect the personalities and abilities of the people assigned and to redistribute responsibilities accordingly. Be certain, however, that in redistributing functions you do not leave any out.

Responsibility and Authority

Before the first project team meeting, meet privately with each individual on the project team. Assign him specific responsibilities. Give him the authority he needs to do his job.

Responsibility and authority go hand-in-hand. Responsibility gives the individual a goal; authority gives him the means for achieving it. Without necessary authority, a team member will be either unable to do his job or forced to go through so much red tape to get authorization to act that he will quickly lose enthusiasm and become frustrated.

It's important, however, that the project manager limit each team member's authority so that it does not impede on another member's. Restrict authority to what is needed to meet a specific responsibility. If you find later that a team member needs or warrants additional authority, you can grant it then. Once you give a team member authority, however, it is difficult to take part of it away from him.

CONCLUSION

A company's performance on any project is only as good as the people's performance as individuals and as members of the project team. The cornerstone of success is the project manager leading and motivating the individuals and the team to achieve the project goals and objectives. By following a standard staffing procedure that first identifies team functions and then objectively evaluates each member's ability to perform those functions, the project manager will be able to create a team in which he can have complete confidence.

CHAPTER 5 KICK-OFF MEETING

NOTES

WHAT IS A KICK-OFF MEETING?

A kick-off meeting is where the company personnel who estimated and bid the project and negotiated the project contract turn over the project to the project manager and his team. It is the first major planning function that involves the people who will actually build the job.

In some companies the project manager estimates and bids jobs. In such cases, the kick-off meeting provides the opportunity for him to assign responsibilities to members of the project team and distribute project documents that each team member can use to familiarize himself with the project details before actual planning begins.

WHO SHOULD PARTICIPATE

Everyone with management responsibilities, authority or detailed knowledge of the project should participate. This includes:

- Project manager
- Estimator
- Sales engineer
- Project engineer
- CEO or other company officer
- Purchasing agent
- Expediter
- Safety officer
- Field superintendent or foreman
- Shop foreman, and
- Accountant or accounting clerk.

In short, everyone who needs to know how the project will be organized and managed should be at the kick-off meeting. Keep in mind also that the kick-off meeting is the first opportunity to get the entire project team together in one place. As a result, it is where the project manager plants the first seeds of team spirit and cooperation. This reason alone makes it worth the effort to get everyone together.

MEETING OBJECTIVES

There are six objectives of the kick-off meeting:

- Give everyone involved an overview of what the project includes (scope of work) and how it will be organized and run (project administration)
- Identify opportunities and challenges offered by the project
- Anticipate possible problems and opportunities that may occur during the course of the project (project anticipation), and set in motion planning activities that will prevent or minimize the impact of the problem if it occurs and that will take advantage of the opportunities.
- Assign each member of the team specific responsibilities within the project
- Give each member of the project team all available project documentation related to his responsibilities, and
- Set a date and assign responsibilities for the pre-planning meeting(s).

THE PROJECT MANAGER'S RESPONSIBILITIES

The project manager's responsibilities regarding the kick-off meeting are:

- Make sure all members of the project team are notified of the meeting and are free to attend
- Develop a preliminary Schedule of Values or billing breakdown

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- Assist the project estimator, the project engineer, the CEO, and anyone else who has detailed knowledge of the project in determining the agenda and preparing materials for distribution, and
- Visit the job site location and complete a report, including photographs or videotape, noting:
  - General site conditions
  - Existing utilities, their locations, and tie-in points
  - Site access
  - Site storage
  - Site security, and
  - Special problems or considerations.

A SAMPLE AGENDA

A kick-off meeting might last an hour; it might last an entire day. It all depends on the size and complexity of the project and the number of people on the project team. Regardless, every kick-off meeting should review the contract documents (including the estimate, the project drawings and specifications, any addenda, and the Pre-job Conference Checklist and Report (see Figure 5-1)) and discuss the following:

- Project goals and objectives
- Scope of work
- Job completion date
- Subcontracts involved
- Work to be done by other trades
- What the project documents say about quality, safety and special conditions
- Referenced codes and regulations
- Project estimate and budget
- Billing schedule
- Profit targets, and
- Results of the initial job site inspection.

Once the basic facts of the project have been discussed, the meeting should consider how the project effort will be organized and managed. Topics should include:

- Project organization and chain of command
- Responsibilities for communications with general contractor, project owner, subcontractors, other trades, suppliers, inspection agencies, etc.
- Strategies for procuring and managing job resources (materials, equipment to be installed, labor, construction equipment, subcontractors)
- Requirements for shop and coordination drawings
- Prefabrication strategy and requirements
- Scheduling of work activities and deliveries of equipment and materials
- Coordination of efforts with other trades on the job, and
- Handling of change orders, claims, emergency situations and special requests to the general contractor or other project authority.

You'll find detailed information on many of these topics in other sections of this manual.

Finally, in preparation for the planning meeting, the agenda should also include:

- Setting a date for the planning meeting(s)
- Assigning responsibilities for gathering information needed for planning, such as drafting letters to the project owner, design professional or general contractor requiring information or clarification regarding the scope of work or details of the contract, and
- Ensuring that everyone has in hand or has ready access to everything he needs to plan his role in the project.

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This sets the stage for the next step, pre-planning, where the project team must design a detailed, step-by-step approach to the construction effort.

FOCUS ON CHALLENGES AND OPPORTUNITIES

All projects have certain things in common. What makes a project unique is the particular challenges and opportunities it presents. These elements should be the focus of planning and project management, because here lies the greatest potential for creativity and profitability.

As part of the kick-off meeting, encourage everyone on the team to identify opportunities and challenges and discover ways to exploit or resolve them profitably. Among common opportunities for increasing profitability are:

- TQM opportunities
- Design errors and omissions
- Unique prefabrication or installation techniques
- Value engineering changes
- Identification of particular customer needs and development of strategies to exceed expectations, and
- Identification of opportunities for expanding or reducing the scope of work.

Among the challenges that, depending on the way they are handled, become either problems or advantages are:

- Errors in the original estimate
- Innovations in material handling
- Troublesome contract clauses
- Scheduling problems such as:
- Conflicts with the activities of other trades on the job
- Inadequate time for obtaining permits, and
- Unavailability of sufficient labor or specific subcontractors at given times.
- Quality requirements
- Safety requirements, and
- Governmental roles and regulations.

There are several advantages to identifying and discussing these items at the kick-off meeting. First, it clears as many obstacles as possible out of the way even before construction begins. Second, it forces everyone on the team to really think about the project and its potential for profitability. Third, it gets everyone working together and creates a "We Can Do It!" attitude—a spirit of enthusiasm and confidence that practically ensures success.

CONCLUSION

The kick-off meeting is the first turning point in the project. It is the meeting where estimating, bidding and theory end, and the real work begins. Some companies omit kick-off meetings from their planning schedules and instead go right from winning the contract to pre-planning. This is a mistake. It throws the project team into a "sink or swim" situation and deprives them of the time they need to digest the general facts, think a little, and get comfortable with working together before having to get down to the grueling details.

A kick-off meeting of just a few hours is a worthwhile investment that pays high dividends, in both its benefits to the project team and its eventual effect on the bottom line.

PRE-JOB CONFERENCE CHECKLIST AND REPORT				
Name of Job			Job No.	
Prime or Subcontract?			Completion Date	
General Contractor			Liquidation Damages	
Estimator	Foreman			
Bond	Insurance			
Progress Billing Date				
Date of Conference	Place			
Persons Present				
Plans and Specs Reviewed	Estimate Reviewed			
Job Procedure Reviewed	Cost Breakdown Reviewed			
Special Conditions				
Materials	Master Material List Issued			
	Charge Slips for Major Materials Written			
	Delivery Schedules Established			
	Major Suppliers Selected			
	Shop Dwgs, Etc., Ordered			
	Date Due			
Manpower	Scheduled			
	Type of Crew			
	Special Conditions (Travel, Premium Time, etc.)			
	Job Shack	Fencing		Telephone
Tools & Equipment	Job Boxes	Special Equipment		
	Tools Ordered		Remarks	
Copies Distributed to	Supt		Foreman	Purchasing
	Controller		Estimator	Gen. Manager
General Comments				

Figure 5-1 Pre-job Conference Checklist and Report

CHAPTER 6 SCOPE OF WORK AND RESPONSIBILITY ASSIGNMENTS

NOTES

DEFINITION AND PURPOSE

This section is an overview of who has responsibility for what on the project. Everything from excavation and insurance to clean up and drinking water is included, and it gives everyone on the job an easy way to check whether a certain task is or is not among the company's responsibilities.

THE PROJECT MANAGER'S RESPONSIBILITIES

Your responsibilities regarding the scope of work are to:

- Obtain a copy of the scope of work document and study it carefully before beginning pre-planning. In some cases, the scope of work is outlined in the bid request from the owner or in the bid proposal prepared by your company. In other cases, it must be derived from the contract documents.
- Distribute the scope of work definition to all members of the project team so that everyone clearly understands what the scope of work includes. A checklist is one possible format for such a definition.
- Insist that the job supervisor consult with you any time he has a question about the scope of work or is not sure whether a particular activity he's been asked to do is within the scope of work, and
- Keep a copy of the scope of work document handy, and refer to it whenever you have a question about job responsibilities.

THE SCOPE OF WORK CHECKLIST

In many cases, the scope of work as expressed in the contract documents or in a letter from the project owner is sufficient for the project team to use. However, some companies prefer to use a standardized Scope of Work Checklist, such as the example provided in .

In Figure 6-1, the first column lists the items directly, or indirectly, related to the work. In the next four columns, simple check marks are used to indicate whether the company is responsible for furnishing or installing each item. (Some companies use more elaborate forms that specify who on the job—the general contractor or one of the other trades—is responsible for a given item.) The last column is for brief notes.

Regardless of how detailed you want your Scope of Work Checklist to be, you must base it on the information in the contract documents and verify its accuracy before distributing it.

SCOPE OF WORK CHECKLIST					
Project Name		Project Number			
Item	**We Furnish**	**We Install**	**Others Furnish**	**Others Install**	**Notes**
1. Access Doors					
2. Clean Up					
3. Concrete curbs					
Concrete pads					
4. Control dampers					
Control valves					
Control wiring					
5. Cutting ceilings					
Cutting walls					
6. Demolition					
• Abandoned systems					
• Maintained systems					
7. Electric heaters					
Electric motors					
Electric starters					
Smoke Detectors					
8. Louvers					
9. Hoists					
• Man					
• Material					
10. Painting of					
11. Patching of					
• Ceilings					
• Walls					
12. Roof curbs					
13. Site utilities					
14. Temporary					
• Heat					
• Water					
• Electric					
• Telephone					
15. Trenching and Backfill					

Figure 6-1 Scope of Work Checklist

CHAPTER 7 PRE-PLANNING MEETING

NOTES

WHAT IS A PRE-PLANNING MEETING?

A pre-planning meeting is where all the members of the project team, as well as other people directly involved in the specialty construction activities of a project, get together before construction begins to develop a detailed strategy for completing the work specified in the contract documents.

THE IMPORTANCE OF PRE-PLANNING

Next to careful staffing, pre-planning is the most important preconstruction activity of the project. It gives everyone a clear and detailed idea of what is involved, offers the opportunity for questioning and brainstorming, deepens the spirit of team commitment begun at the kick-off meeting and produces a step-by-step strategy for approaching the job. The importance of early pre-planning is clearly shown in Figure 7-1 by following the ability to influence cost and schedule curve and the percentage of cash paid out curve.

Practically all of the most successful specialty contracting companies in the country insist on pre-planning for every project, regardless of the project's size. Whether its a few hours spent mapping out a small job or several days spent on a large one, they find that the time and effort invested pays off not only in increased profits but team morale.

Pre-planning is so important to many companies that meetings are routinely held at a location away from the office, ensuring that the planning effort is free from daily distractions.

OBJECTIVES OF THE MEETING

The objectives of the pre-planning meeting are:

- Identify and introduce key players in the project
- Briefly review the project's scope of work and special requirements
- Assign management responsibilities and authority
- Implement administrative policies and procedures for safety, quality control, resource management and project documentation
- Design a comprehensive and practical project schedule, and
- Devise a workable scheme for short interval planning throughout the life of the project.

WHO SHOULD ATTEND

Attendees of the pre-planning meeting depend on several factors including the size and complexity of the project and the level of involvement of people such as suppliers and subcontractors. The project manager should consider these factors in preparing his list of attendees.

Among the project team members who should be considered at every pre-planning meeting are:

- Project manager(s)
- CEO or other company officer
- Estimator
- Purchasing agent
- Field superintendent
- Job foreman
- Shop foreman
- Head of drafting department
- Project manager's administrative assistant
- Scheduler
- Accounting department manager or job cost analyst
- Warehouse manager

NOTES

- Safety director, and
- Service and start-up manager.

Depending on the size and structure of the project, you may find it necessary to include the following people in the pre-planning effort:

- EEO director
- Office manager
- Subcontractors, and
- Vendors.

These lists are not exhaustive. You may find it necessary to add people to them. In many companies, two or more of the positions listed above are held by one individual. The important thing to remember is that all of the functions listed above must be represented at the pre-planning meeting.

A major factor in scheduling a pre-planning meeting is the availability of the people involved. It is extremely difficult in a busy company to get everyone together for a one-day meeting, let alone a series of meetings that, for massive projects, might last several days. In light of this, the project manager should arrange the meeting agenda so that only the core project team need be present for the entire meeting. This will allow the other necessary personnel to attend for a few hours or for a single day in order to make their contributions to the planning effort.

THE MEETING AGENDA

The project manager should prepare an agenda and distribute it to all meeting attendees well in advance of the actual meeting date. Advance notice of the topics to be covered, as well as repeated notices of the meeting's date, time, and location, help ensure that everyone will attend and arrive prepared.

The length and content of the agenda depends on the size and complexity of the project. While it is impossible to generically identify all topics to be covered, the sample Pre-planning Meeting Checklist in Figure 7-2 offers a good starting point. It provides a fairly comprehensive list of points that every planning effort should consider.

An example of the Job Data Sheet mentioned in the first item on the Checklist is found in Figure 7-3. It identifies project members and provides contact information for each of the principals. Every member of the project team should receive a Job Data Sheet at the pre-planning meeting and revised copies of the sheet as necessary during the course of the project.

Most of the items on the Pre-planning Meeting Checklist are covered in other sections of this manual, and you should be familiar with the objectives and procedures related to each one prior to the planning session. These sections also contain forms and checklists that are useful in the planning effort.

FOCUS ON SCHEDULING AND MATERIAL HANDLING

The two most important items to consider during pre-planning are scheduling and material handling. The project team must not only schedule the job activities listed in the scope of work, but schedule and coordinate the resources and support activities that make construction possible. Some of the resources and support activities that need to be addressed are:

- Labor
- Equipment, and material purchases and deliveries
- Construction equipment
- Subcontractors, and
- Prefabrication (see Chapter 30 for details).

See Chapter 23 for scheduling techniques in each of these areas.

Minimizing double-handling and on-site storage of materials is essential to efficiency at every stage of the project. For this reason, material handling must be a major focus of the planning

NOTES

effort. Before the pre-planning meeting, the project manager and the job superintendent or foreman should do two things in preparation for the planning discussion:

- Inspect the job site for situations requiring special material handling procedures, and
- Meet with the general contractor or construction supervisor to discuss material handling and storage facilities that will be available during the project.

See Chapter 29 for information on Material Handling.

MEETING MINUTES AND COMMUNICATIONS

The Project Manager should assign someone the responsibility of recording the minutes of the pre-planning meeting so that the project team will have a complete record of its decisions, planned actions and assigned responsibilities. Have these minutes typed and distributed to all members of the project team as soon as possible after the meeting, and encourage everyone to review them. Invite questions or comments, and issue updates and addenda, if necessary.

Distributing complete sets of pre-planning meeting minutes demonstrates your commitment to keeping everyone on the project team informed and channels of communication open. It also gives everyone a ready reference to use in answering questions that might arise later.

CONCLUSION

The pre-planning meeting is your best insurance against surprises once work begins. It firmly establishes a system of management by action and anticipation rather than reaction and frustration, and gives everyone a sense of confidence in your control and knowledge of the project. Perhaps most importantly, it gives everyone involved an opportunity to contribute to the planning of work and communicates a clear message to the project team: *"Your ideas, suggestions, and experience are welcome here."*

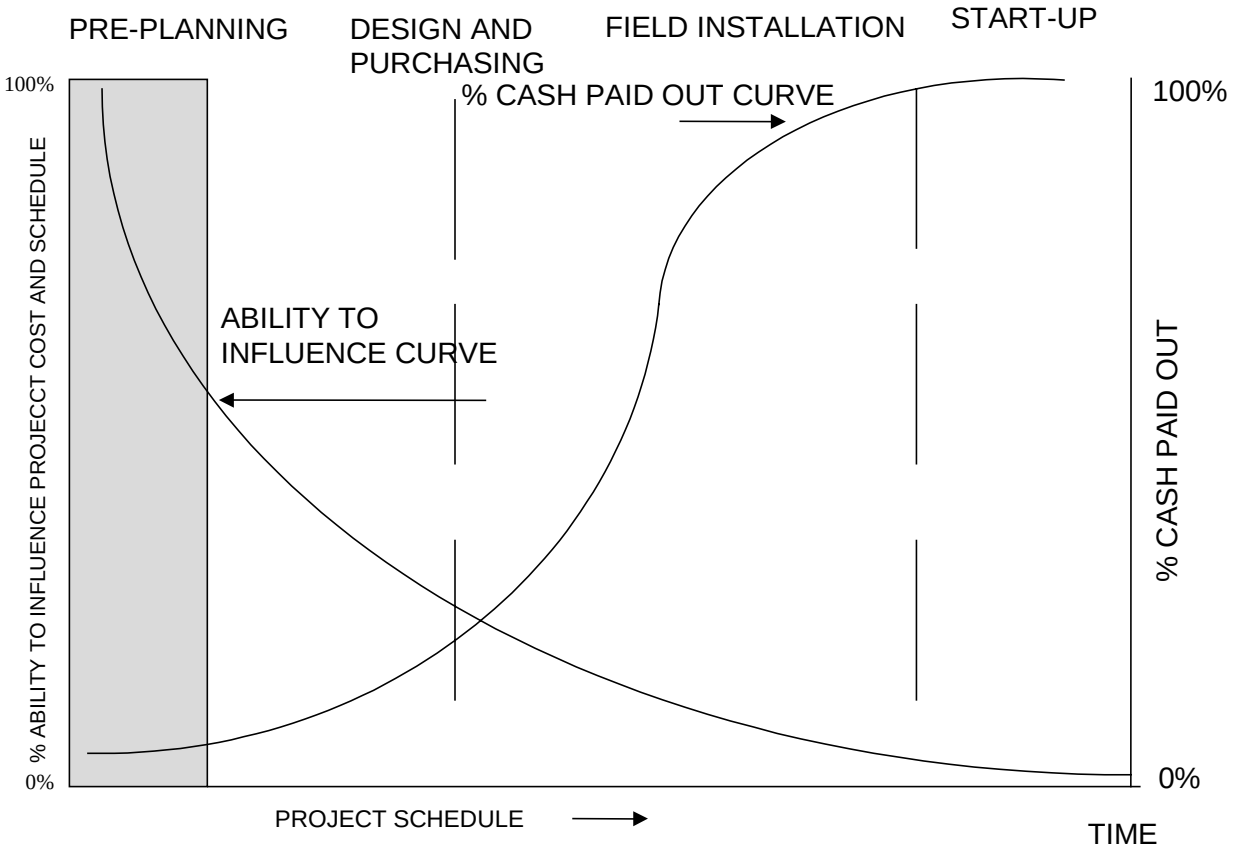

Figure 7-1 Ability to Influence Project Cost and Schedule vs. Time Project Performance Curve

PREPLANNING MEETING CHECKLIST	
Date	Job
Attendees	

A. SEQUENCE

Check	Item	Comments/Action Required
	Review Job Data Sheet	
	Review Scope of Work	
	Review Direct Job Costs in Bid	
	Review Job Site Organization	
	Review Safety Requirements	
	Report Procedures	
	Review EEO Requirements	
	Review Job Records	
	Reporting Procedures	
	Review Billing Procedures and Requirements	
	Review Quality Control Procedures	
	Review Paperwork Flow	
	Review Start-up Procedures	
	Review Short Interval Planning Procedures	
	Review Requirements for Operation/Maintenance Manuals	
	Review Completion of Project	
	Review Plans & Specifications	
	Review Equipment Purchase Orders	
	Review Material Purchase Orders	
	Review Subcontractor Purchase Orders	
	Prepare Equipment Delivery Requirements	
	Prepare Material Delivery Requirements	

Figure 7-2 Pre-planning Meeting Checklist (Sheet 1 of 2)

	Check	Item	Comments/Action Required
		Prepare Fabrication Schedule (if applicable)	
		Review Material and Equipment Handling Requirements	
		Determine Special Tools and Rigging Required Material Handling	
		Determine Requirements for Cranes, Hoists Required Material Handling	
		Review Special Tools and Equipment for Installation	
		Review Activities Schedule	
		Review General Contractor Schedule	
		Review Detailed Schedule	
		Review Subcontractor Composite Crew Requirements	
		Review and Complete Labor Unit Breakdown	
		Prepare Manpower Loading Chart	

B. Subcontracts

	Trade	Subcontractor	Comments/Clarification

C. Restrictions on Purchased Items

D. Control Delivery Items and Dates

Figure 7-2 Pre-planning Meeting Checklist (Sheet 2 of 2)

JOB DATA SHEET			
Project Name		Project Number	
Start Date	End Date	Monthly Billing Date	
	Company Name & Address	**Telephone, Fax, Cellular Number(s), and E-mail**	**Contact**
Owner			
Developer			
Architect			
Construction Manager			
Structural Engineer			
Mechanical Engineer			
Electrical Engineer			
CONTRACTORS			
General			
Other			
SUBCONTRACTORS			
Other			
MISCELLANEOUS			

Figure 7-3 Job Data Sheet

CHAPTER 8 SHOP AND COORDINATION DRAWINGS PROCESS

NOTES

Everything associated with shop and coordination drawings is usually looked upon as a low priority and unnecessary activity. Why should we bother if they are used on only one job? However, if you, as project manager, neglect any part of this activity, it can result in very poor project performance in cost, schedule, and quality. Shop and coordination drawings are important because they:

- Define exactly what is to be built in the shop for installation in the field
- Define for the field the exact size, shape, weight, and dimensions of what they will have to install in the field installation
- Define areas of interface with other crafts and help in establishing the sequence of field installation activities
- Can verify from all contractors involved, the exact controlling dimensions surrounding these interfaces, any errors in these drawings will result in costly rework and possibly delays in the schedule

WHEN SHOULD DRAWINGS BE PREPARED?

There is no single answer to this question that will fit every project. The answer is impacted by many different variables that change from project to project. Some of these variables are:

- Accuracy and completeness of the contract drawings
- Experience of the shop doing the prefabrication
- Possible use of company standards
- Complexity of the project, and
- Experience of the field installation personnel.

The best time and place to address this issue, therefore, is during the kick-off meeting, when all team members involved can have input to the decision and collectively determine when, the whether, when, who, and how of drawing preparation. As Project Manager it is essential that all of the requirements of the specification, referenced standards, and applicable codes are met in the prepared drawings.

HOW SHOULD SHOP DRAWING PREPARATION BE SCHEDULED?

The schedule is driven by the date the fabricated items are needed at the site. The project manager should schedule, as the latest starting date, the beginning date for preparation of the drawings. This will provide adequate time for drawing preparation, internal and external review and approval, delivery of material and equipment (if required), shop fabrication time, and delivery to the site. It is good practice to begin preparing the shop drawings at the earliest start date. This provides plenty of time for recycling for approval or any other slip up on the schedule and still meet the need date for site erection.

MANUAL VS. CADD DRAWING PREPARATION

This decision will vary from job to job and should be based on economics, schedule, specifications, electronic data available, and the type and scope of the contract work to be done. Usually, it is not advisable to use CADD systems on retrofit type projects due to the absence of an electronic database of the facility being modified.

Some CADD systems provide a detailed summary of ductwork, fittings, air distribution, etc. This can eliminate additional take-off labor.

NOTES

GUIDELINES AND EXTENT OF DETAIL

Shop drawings should be prepared in sufficient detail to meet the needs of the shop for fabrication, and the field for installation and erection.

AVAILABILITY OF CADD BACKGROUND DRAWINGS

Many Architectural/Engineering (A/E) design firms now prepare drawings utilizing CADD systems, and will supply background drawings to you. This may reduce your cost for shop drawing preparation. However, you must be sure the two CADD systems are compatible, before you start. The background drawings from the A/E firm should be obtained in digital electronic format.

AVAILABILITY OF EQUIPMENT SUBMITTALS

Shop drawings cannot be prepared without the final approved equipment submittal drawings. These submittals must be expedited by the project manager to be sure they are available to meet the shop drawing schedule.

SHOP DRAWINGS BY SPECIFICATIONS OR SHOP STANDARDS

Shop drawings must be prepared to meet:

- All applicable building codes
- Any specific contract requirements, and
- Your company's standards.

OPTIMIZATION OF ROUTING

Any possible cost reductions through use of shop fabrication will be lost if the routing and approval systems fail. This is the weakest link in the shop fabrication system. The project manager must set up an expedited tracking system, to be handled by the project manager or an administrative support team member. This expediting must be done almost daily to assure schedule performance.

CONCLUSION

The drawing process is a very critical element in the coordination or shop fabrication system, and is also that element of the process most likely to fail. Failure in this system is not very visible until it is too late to recover. Therefore, success can best be assured by firm assignment of responsibility and authority and a continued follow-up on a regular basis by the project manager.

CHAPTER 9 INTERVAL PLANNING

NOTES

WHAT IS INTERVAL PLANNING?

The master schedule developed in the pre-planning meetings is usually too long and complex to manage effectively. What's needed is a way to break down the overall project schedule into small, manageable segments. Interval planning is the way to do this.

Interval planning involves dividing the project into tasks that take one to two weeks to complete, then meeting at the end of every interval to review progress and plan the next interval. Some of the advantages of interval planning are:

- It gives you, your project team, and your field crews specific work goals that can be achieved in 5–10 work days.
- It gives you a practical way to track progress. It is far easier to determine whether a two-week task is 50 percent complete than to determine the same thing for an entire ten-month project.
- It allows you to quickly spot and correct problems.
- It gives your project team an opportunity to prepare for upcoming job conferences and meetings with the owner or general contractor, and
- It focuses attention on tools, materials, and equipment that must be available so that crews can work efficiently.

WHO SHOULD ATTEND?

Everyone who is directly involved in the preceding or upcoming short interval or who has information of general interest should attend. The following project team members should participate:

- Project manager
- Job supervisor(s)
- Field superintendent
- Shop foreman
- Subcontractors
- Drafting personnel, if required, and
- Purchasing agent, if required.

THE PROCESS

The interval planning process begins during pre-planning, when the project team reviews the job breakdown, creates a master schedule, and determines planning procedures to follow for the course of the project. It is at this stage that the project manager must persuade everyone on the team of the importance of interval planning and his determination to implement it. He should assign each person responsibilities for interval planning and get everyone into the habit of visualizing the project as a jigsaw puzzle in which each piece is a job that takes 5–10 days to complete.

The first interval planning meeting should be held before the first day of work on the job site. Subsequent meetings should be held every 5–10 working days, on a regular basis. To take full advantage of the interval planning process, every meeting should do the following:

- Use the Activity Pre-plan or the Interval Planning Checklist (see Figure 9-1 or Figure 9-2, respectively) as an agenda
- Review the work scheduled for completion during the last interval and check work progress:
  - What has and has not been successfully completed during the last interval?
  - What caused the team to fall short of its goals:

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    - Delays caused by owner, general contractor, design professional, or other trades?
    - Delays in material or equipment deliveries?
    - Poor weather?
    - Lack of planning, communication, or necessary action by member(s) of the project team?
    - Error in the original estimate of the time required to complete the task?
    - Change in crew assignments?
  - What effect will uncompleted activities have on:
    - The next interval?
    - The project as a whole?
- Adjust projected cost to complete each activity in the job cost control system (see Chapter 16)
- Modify the job schedules to reflect the impact of the previous intervals by:
  - Scheduling completion of uncompleted activities, and
  - Adjusting and utilizing float time.
- Plan the work for the next interval by:
  - Using the master schedule to identify tasks that can be accomplished during the next interval
  - Organizing work activities into a priority sequence, and
  - Putting in writing the work goals of the upcoming interval.
- Make specific personnel assignments that:
  - Give responsibility for each task to a particular individual, and
  - Create crews of optimum size and skill level to get each task done efficiently.
- Schedule subcontractors and related trades. Specifically:
  - Identify priority tasks for completion
  - Minimize stacking of trades
  - Create a checklist that tells you at a glance what each subcontractor and other trade is expected to be doing on a given day. A sample checklist is shown in Figure 9-3.
  - Use the checklist to minimize stacking of trades and to schedule your crews to avoid congested areas and scheduling conflicts
  - Verify the availability of each subcontractor's materials and equipment
  - Make sure each subcontractor or trade has sufficient skilled manpower on the job, and
  - Provide adequate instructions to each subcontractor's job supervisor.
- Plan fabrication requirements by:
  - Identifying fabricated components needed on the job during the next interval
  - Coordinating delivery and erection of materials, and
  - Establishing a sequence of fabrication for components needed for the next two to four planning intervals, so that drafting and fabrication priorities can be set to support job requirements.
- Satisfy tool and equipment requirements by:
  - Determining what tools and equipment not already on the job will be needed during the next interval
  - Scheduling deliveries of necessary tools and equipment to the job, and
  - Returning all unneeded tools and equipment to the warehouse or to other projects, as needed.
- Assign an individual to make sure that suppliers will meet all delivery dates for material and equipment needed during the upcoming intervals, allowing adequate lead times
- Establish material and equipment handling procedures on the job site to make sure that:
  - Everyone understands how specific items will be received, unloaded, and moved to their final destinations, and
  - All equipment (cranes, hoists, etc.) needed to handle deliveries is available.
- Discuss the interval that will follow the upcoming one, paying particular attention to:

NOTES

  - Meeting all lead times for purchases, prefabrication, and the scheduling of labor, construction equipment, and tools, and
  - Anticipating the effects that job situations and scheduling changes might have on subsequent intervals.
- Review the interval planning process itself and revise it, as necessary, to make it more efficient and responsive to job needs, and
- Identify the date of the next general contractor's job conference. If appropriate, plan to hold a short meeting prior to the conference to help the project manager prepare for it.

THE IMPORTANCE OF ACCURATE REPORTING

When a particular activity falls behind schedule, some job supervisors tend to hide the fact, hoping to compensate during the next interval and therefore avoiding performance questions or criticisms. This behavior is often a symptom of lack of trust among project team members, and it can have a devastating effect.

For interval planning to be successful, the project manager must know at any given time exactly where each task stands. One inaccurate report of job progress can throw the entire project off balance further down the line, upsetting the sequence of activities and the coordination of trades and crews, and creating inaccurate data for the planning of other intervals and projects. To avoid this, the project manager should, from the very first day of the project:

- Encourage each job supervisor to honestly report his crew's progress on each activity
- Avoid criticizing or reprimanding a supervisor for using more labor hours than anticipated to complete a job
- Treat overruns (and underruns) on labor hours as situations to be analyzed, not as personal mistakes
- As part of the analysis of each overrun, explore the reasons that the overrun occurred, what effect it will have on other job activities, and how to avoid similar overruns in upcoming intervals, and
- Use the project team's analyses to revise labor estimates on similar tasks and refine the company's overall estimating procedures.

By creating a "safe environment" for everyone on the project team—an environment where no one fears reporting negative project developments or voicing their ideas or recommendations—the project manager ensures that the information he receives is timely, and complete.

CONCLUSION

Pre-planning and interval planning go hand-in-hand. Pre-planning creates an overall strategy for the project and breaks the project into workable units. Interval planning continually updates and revises that strategy to keep it on track despite the unexpected developments that haunt every job. Without pre-planning, interval planning has no foundation; without interval planning, the results of the preplanning effort become obsolete within the first few weeks of work.

ACTIVITY PRE-PLAN			
Project			
Project No.		Plan By	
Activity Description			
Foreman		Plan Date	
Scheduled Start	Date	Expected Finish	Date
	Time		Time
Crew			
Drawings/Specification References			
Materials/Equipment/Expendables Required			Quantity
Tools and Equipment Needed			Quantity
When Finished with This Activity			

Figure 9-1 Activity Pre-plan

INTERVAL PLANNING CHECKLIST			
Date			
Attendees			
Dates of Action Plan		From	To
	Check Item	**Description**	**Comments**
		Review Master Schedule and Previous Interval Plan and Results	
		Determine Work to be Accomplished During Next Interval	
		Determine Optimum Crew Sizes and Skill Levels	
		Review Subcontractor Scheduling	
		Review with Subcontractor Availability of Manpower, Material and Equipment to Meet Schedule	
		Review Prefabrication Requirements	
		Review Tools and Special Equipment Requirements	
		Review Material Deliveries	
		Review Equipment Deliveries	
		Review Material Handling Procedures	
		Summarize Plan and Expected Results	

Figure 9-2 Interval Planning Checklist

CHECKLIST FOR ACTIVITIES OF SUBCONTRACTORS AND OTHER TRADES	
Job	Date
Period Covered by Check List: From	To
Instructions: List all subcontractors and other trades on the job. Note scheduled delivery dates for their materials and equipment and their assigned storage areas. Also list the dates of their construction activities and the areas they will be working in.	

Trade/Contact	Storage Area	Delivery Date(s)	Construction Area(s)	Construction Date(s)

Figure 9-3 Checklist for Activities of Subcontractors and Other Trades

CHAPTER 10 PROJECT ORGANIZATION

NOTES

KNOWING HOW THE JOB IS ORGANIZED

It's essential for every member of the project team to know who the key players on the job are and where they fit in. An organizational chart gives them that information. It's a simple diagram showing the relationships among the key players on the job—both within and outside the company—that serves as both a convenient way for everyone to orient himself to the project and a ready reference tool.

THE PROJECT MANAGER'S RESPONSIBILITIES

Prepare an organizational chart of your project team (see Figure 10-1) as part of your staffing procedure (see Chapter 4). Be certain the chart clearly shows which members of the team are responsible for communication with outside parties—the project owner, the general contractor, subcontractors, suppliers, etc.

Distribute and discuss the chart at the turnover and pre-planning meetings, making sure that everyone:

- Knows the project's chain of command
- Directs all communications to the proper person, and

TEAM BUILDING

The project manager must work with those people assigned to the project and develop them into a cohesive unit dedicated to achieving the goals and objectives of the project. The number of people on a project will vary depending on the size and scope of the project. Generally, a small project will have fewer people than a large, complex project. These people form the project team. Regardless of size, the project manager must, through leadership and motivation, work with the team members collectively and individually to achieve a successful, profitable project. The best opportunity the project manager has to lead, motivate, and develop team work is at the initial kick-off meeting.

The kick-off meeting is the activity where the project manager has maximum opportunity to bring the team together and influence the overall performance of the project. Good planning at this time minimizes managing by crisis later in the project by putting out fires.

CONCLUSION

Proper project organization and team building seem like simple things and minor details. This couldn't be a more inaccurate statement. Although simple in form, these two concepts establish the necessary ground rules for project communication and success. They should not be overlooked.

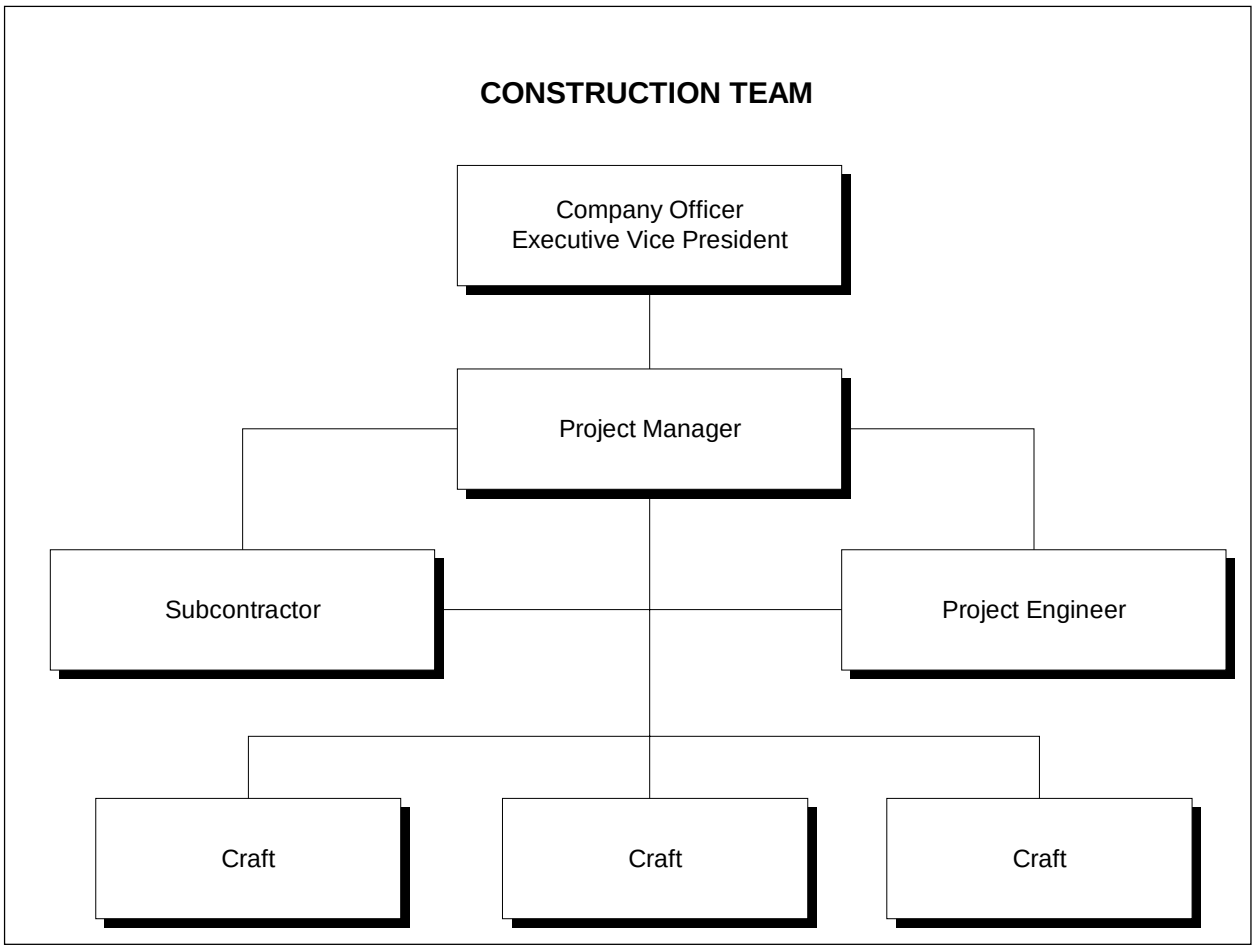

Figure 10-1 Sample Organization Chart Guidelines

CHAPTER 11 JOB SITE ORGANIZATION

NOTES

ORGANIZATION AND JOB EFFICIENCY

Few things give a project a better start or pay bigger dividends than good job site organization. Practically anything you can do to organize your own efforts and coordinate them with other trades on the job will go a long way toward eliminating confusion and improving everyone's efficiency throughout the project.

BASIC GOALS OF JOB SITE ORGANIZATION

There are two basic goals in organizing a job site:

- Organize your own efforts, and
- Coordinate your efforts with the general contractor and the other trades on the job.

Both goals demand that the project manager and the job supervisor assume responsibility for organizing the job site. Working in an environment that someone else has organized for you can be very difficult.

The aim of coordinating your efforts with the general contractor and the other trades is to eliminate confusion and improve efficiency and security. It's an effort that requires you and your project team to stay abreast of the other trades' schedules.

In addition, you and your on-site supervisor have to establish a good working relationship with the general contractor and the other trades—a cooperative relationship that can be used to mutually solve scheduling and organizational problems as they arise.

A PRACTICAL APPROACH

Organizing a job site is not a difficult task, but it does require a step-by-step approach that includes:

- Inspecting job site conditions
- Assessing facilities for material handling
- Identifying suitable trailer and storage areas
- Meeting with the general contractor to finalize job site arrangements, and
- Implementing systems for:
  - Filing job paperwork
  - Maintaining as-built drawings
  - Receiving deliveries
  - Handling material and equipment
  - Renting construction equipment
  - Controlling tool use and storage
  - Housekeeping
  - Systemization of coordination drawings, and
  - Systemization of job site safety requirements.

INSPECTING JOB SITE CONDITIONS

Together with your job supervisor, inspect the job site before moving your job trailer and other equipment and facilities there. Pay particular attention to:

- Existing services (water, sewer, gas, electricity, telephone)
- Points of connection to existing services
- Temporary utilities
- Access to and from the site
- Parking areas

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- Trash disposal areas, and
- Security arrangements.

Note situations that require special consideration or that might pose problems at certain stages of the project.

ASSESSING FACILITIES FOR MATERIAL HANDLING

Review the material handling strategy for the project and inspect the job site with that strategy in mind. Note the configurations of loading docks, hoist and lift areas, and traffic patterns. Evaluate available storage areas.

The "Material Handling" section of this manual (see Chapter 29) includes a checklist that is particularly valuable for this inspection.

IDENTIFYING SUITABLE TRAILER AND STORAGE AREAS

Based on your evaluation of job site conditions and your material handling strategy, identify suitable trailer sites and storage areas. Pick locations that are:

- Near the work area or inside the job building
- Convenient for all stages of material handling, from unloading through installation
- Permanent for the duration of the project, and
- Secure.

MEETING WITH THE GENERAL CONTRACTOR

After your inspections of the job site and your evaluation of site conditions, call together the members of the project team to review your findings and prepare a list of questions and recommendations for the general contractor. Then, together with your job supervisor, meet with the general contractor to discuss your inspection results and your team's evaluation in detail. In particular, discuss:

- Correction of hazardous or otherwise unsuitable conditions, specifying the correction(s) required and setting dates for completion
- Material handling requirements, including general facilities or equipment (ramps, hoists, crane, etc.) and access or equipment for special deliveries. Give the general contractor tentative dates for all special deliveries, if possible.
- Locations for office and storage trailers and storage areas, and
- Security arrangements and the security responsibilities of both parties.

If held early enough, this meeting gives your team first pick among sites and facilities available to all the trades on the job. It also helps establish your team's reputation for professionalism and attention to detail and strengthens the channel of communication between your team and the general contractor.

IMPLEMENTING JOB SITE SYSTEMS

Project Files

Immediately after the pre-planning meetings, once you have established the requirements and strategies for the job, have the company office prepare two sets of file folders for all anticipated filing categories. Examples of these categories are:

- Accident reports
- Approved inspection prints
- As-built drawings
- Correspondence
- Daily job log forms
- Delivery and return records for oxygen and acetylene tanks
- Equipment rental records

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- Job meeting minutes
- Manpower loading charts
- Purchase orders
- Receiving reports
- Safety reports
- Schedules
- Time cards (labor report forms)
- Warranty information, and
- Others.

One set of folders is for your own project file. The other is for the job supervisor's files at the job site.

Emphasize to the job supervisor the importance of filing each project document in the proper folder as soon as it is received.

As-built Drawings

Be certain that everyone clearly understands that accurate as-built drawings are not only a requirement of the job contract but also an opportunity for obtaining service work after construction is completed. Provide a clean copy of project drawings for use exclusively as as-builts and insist that all subcontractors as well as your job supervisors record all changes daily.

Finally, establish a procedure for submitting as-builts to the company office, both periodically as part of the job reporting procedure and at the end of the project for redrafting and submission to project owner.

See Chapter 41 for additional information on as-built drawings.

Receiving Deliveries

Good receiving procedures are critical to maintaining a smooth flow of materials and equipment to the job site and identifying problems with incoming deliveries. The most important steps in this procedure are:

- Assign delivery receipt responsibility to one person
- Coordinate communications between the office and the field to ensure that the job site knows all expected delivery dates, what is being delivered on each date, and whether the required paperwork for verifying the items and quantities being delivered has been provided, and
- Specify and enforce procedures for inspecting delivered merchandise, comparing the packing slip to a copy of the purchase order, signing the shipper's bill of lading, reporting damage and shortages to the office, moving deliveries to the installation site or to storage, and submitting paperwork to the office.

See Chapter 31 of this manual for more detailed information on receiving and storage.

Handling Material and Equipment

Tight organization of material and equipment handling arrangements is a prerequisite for reducing double-handling and ensuring job safety. The organization effort should include establishing procedures for:

- Coordinating purchasing and construction activities to ensure that equipment and materials arrive at the job site when they are needed and are packaged for most efficient handling
- Guaranteeing that proper handling equipment (crane, forklift, etc.) and storage areas are available when the deliveries arrive
- Coordinating the fabrication shop and job site to ensure that prefab materials are received at the job site when they are needed and are packaged for most efficient handling

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- Using paperwork as a communications tool by including material handling instructions on all purchase orders and insisting on the use of Material Handling Instruction Cards, and
- Coordinating activities with the other trades to keep material handling pathways clear, prevent conflicts over the use of crane, hoists, etc., and provide for adequate spacing of trades.

Each of these points is discussed in the "Material Handling" section (see Chapter 29) of this manual.

Housekeeping

Good housekeeping isn't just a matter of job site aesthetics. Keeping work areas and material handling paths free of clutter is essential to job safety and avoiding back charges. As part of the job site organization effort, a successful project manager should:

- Review contract documents to determine the general contractor's or owner's housekeeping responsibilities and the specialty contractor's responsibilities
- Assign your company's responsibilities to an individual on the project team and charge him with enforcing good housekeeping practices among your company's mechanics and the subcontractors, and
- Keep track of changes in housekeeping responsibilities as dictated by change order work and modifications of the general contractor's or owner's policies.

Coordination Drawings

As project manager, you should establish procedures that will initiate, develop, and distribute coordination drawings. The procedures should define the following drawing requirements:

- Scope and purpose
- Activity levels/users
- Schedule, and
- Review cycle.

Job Site Safety

The project manager should ensure that adequate safety rules and procedures are being implemented at the job site. You should establish a procedure that organizes all job site safety paperwork, documentation, and associated requirements. A job site safety file should be established to retain safety documents and respective forms and reports (see Chapter 17).

CONCLUSION

If the project team isn't organized from the beginning, it will never be organized. Initially spending time to set up the job properly, allows the project manager and the job supervisor to put most of their administrative decisions behind them. This frees them to focus on construction management without having to develop procedures and systems as they go along.

CHAPTER 12 CONTRACTS AND CONTRACT DOCUMENTATION

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WHAT IS A CONTRACT?

A contract is a document or set of documents that expresses the expectations and responsibilities of the parties involved in a project and protects each party's rights regarding the project. Although it is legally binding, the real essence of any contract is that it is an expression of trust between the parties. The parties to a construction project contract might be a project owner and a trade contractor, or a general contractor and a trade contractor, or a construction manager (acting as the project owner's agent) and a trade contractor. In cases where a trade contractor acts as the general contractor, the company has a contract not only with the project owner but with each of the other trades on the job. The same situation occurs whenever one company subcontracts to another.

Other types of legally binding contracts are common in the construction industry, including:

- Loan agreements
- Insurance policies
- Completion and performance bonds
- Purchase orders for trades equipment and materials
- Lease agreements for construction equipment
- Shipping documents
- Labor agreements, and
- Joint venture agreements.

Many of these types of contracts are discussed in other sections of this manual. For the purpose of this section, however, we will focus only on construction contracts.

A MATTER OF EXPECTATIONS

A contract is necessary because each party has its own expectations. Sometimes, these expectations conflict with the expectations of the other party. The trades contractor expects a reasonable profit, satisfactory working conditions, fair treatment, and timely payment. The project owner or general contractor expects quality work at a reasonable cost, timely completion, and fair treatment.

Both sets of expectations are based on the desire for profit. Seen from this perspective, the contract becomes the ground on which each party tries to establish conditions in which it can maximize its profit. For his part, the trades contractor wants a contract that allows him maximum opportunities for doing a quality job at the lowest reasonable cost and for the highest reasonable fee. The project owner or general contractor, on the other hand, wants the contract to ensure that he gets quality work but for the lowest reasonable fixed price or fee. It is here where the potential for conflict arises.

The contract recognizes that this conflict exists but also expresses each side's willingness to compromise for mutual benefit. It's easy to see why the contract is so important—it sets the ground rules for the project. It also defines the business relationship and provides guidelines for dealing with the unforeseen events that plague every project and threaten profits.

WHAT A CONTRACT SAYS

Despite its fine print and legal jargon, a construction contract essentially states six simple things:

- Who is responsible for the tasks
- How the work is to be done
- When it is to be completed
- What the finished product must be

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- Who gets paid, how much, what, and when, and
- What happens when something goes wrong.

Unfortunately, it is the nature of the construction process for these simple things to become enormously complicated. It is because of these complications that contract documents must be so precisely worded and thoroughly detailed.

In the end, though, a contract is still just a confirmation of an agreement. As the number of contract disputes in the industry will attest, each contract is only as good as the people and the companies who sign it.

GENERAL TYPES OF CONTRACTS

There are three general classifications of contracts used in the construction industry: express contracts, implied contracts, and negotiated contracts.

Express Contract

An express contract is one in which all details of agreement are specifically spelled out. It is used in situations where the terms and conditions of agreement between the parties are complex or contain elements where clarity of understanding is important for the protection of both parties. Most plan and specification projects involve express contracts.

The advantages of an express contract are that everything is clearly stated and there is little room for misinterpretation. Among its disadvantages is the fact that items not included can become points of contention and the “letter” of the contract can become more important that the “intention” of the contract.

Implied Contract

An implied contract is one in which the terms are not expressly stated but are inferred by law from the acts of the parties and the surrounding circumstances. It is most practical in situations where the tasks involved in the agreement are generally understood and accepted by both parties. A good example of an implied contract is a case where a project manager, faced by an emergency, telephones a local supplier for rush delivery of an item. He does not specifically mention to the supplier that his company will pay for the item, but the agreement to pay is implied and is enforceable.

Implied contracts allow for flexibility and minimize red tape. However, flexibility can lead to abuse, and arbitration or litigation is often required to resolve conflicts that arise.

Negotiated Contract

A negotiated contract is one in which parameters are stated but specific details are left to be resolved at a later date by agreed-upon means. Most design/build projects are ruled by negotiated contracts, primarily because the full details of the work are not known at the time construction begins. For example, a contractor may agree to install HVAC in a new shopping center, even though plans for the work are not fully established and a specific contract amount cannot be agreed upon until they are.

The obvious advantages of a negotiated contract are that it allows a project to start without the delays associated with the preparation of detailed contract documents. It also allows the parties to negotiate terms according to actual project conditions. The disadvantages are just as obvious. Since the basic expectation of both parties, i.e. profitability, is uncertain at the time the contract is signed, a negotiated contract relies heavily on the good faith of the contractants and on favorable job conditions. As a result, unless the basic parameters of the contract are clearly stated and understood, conflicts are likely to arise.

One frequently used and successful type of negotiated contract is the “cost-plus-fixed-fee” or the “cost-plus-percentage fee” contract. A cost-plus contract provides a formula for determining the fair price of the work as it is done and often sets a guaranteed maximum price (GMP) for the project. As a result, both the contractor and the project owner are protected. In this type of

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contract, only major changes in the scope of work or the original intent of the contract results in adjustment of the GMP.

THE PRICING OF CONSTRUCTION CONTRACTS

In the construction industry, contracts are categorized not only by whether their terms are expressed, implied or left to negotiation but also by the way their dollar value—known as the contract price or contract amount—is calculated. A contract amount can be determined by any of three methods: lump sum, cost-plus-fee, or unit price.

In lump sum pricing, the contractor's (or subcontractor's) fee for services is established as a total contract amount. It is the usual pricing method used for plan and specification projects, where the financial goals and details of the work are well established. The advantage of lump sum pricing is that it gives the contractor a set target to shoot for. The disadvantage lies in the fact that a lump sum contract allows no flexibility for adjustments required to financially cover the cost of unforeseen job conditions.

In cost-plus-fee pricing, payments for services are based on the contractor's expenses plus a set fee, usually a percentage of the expenses. Here the contractor has the advantage that if he carefully records all his costs, he is almost certain of a profit. On the other hand, the enormous amount of paperwork involved can be very time-consuming, and if any expenses are not recorded, the cost of those expenses and their associated fees are lost.

The unit pricing method establishes fixed price payments based on the number of installed units. Here again, the contractor has an advantage. If he accurately estimates the pricing of the units and can install them efficiently, he is almost assured a profit. A single error in estimating unit costs, however, can be disastrous, and slumps in the efficiency of installation crews can eliminate the profits for the entire job.

THE PROJECT MANAGER'S RESPONSIBILITIES

In some companies, the project manager is also the project estimator, in which case he is intimately familiar with the plans and specifications or other terms of the contract long before construction begins. In most organizations, however, the roles of estimating, contract negotiation, and project management belong to separate individuals or departments. This puts the project manager in the position of starting the project knowing very little, or nothing at all, about the contract.

Although an unenviable position, this is no excuse for failing to study the contract thoroughly and developing a clear, practical understanding of its contents. Indeed, all of the project manager's responsibilities related to contracts can be stated in one sentence:

Know Without Any Doubt What The Contract Says
And Organize And Run The Project Accordingly.

There are two steps in developing the kind of detailed knowledge about the contract that you need:

- Read and reread the contract until you understand what is clear and straightforward and have identified what is vague or confusing, and
- Meet personally with people who can answer your questions about the vague or confusing parts of the contract.

If the answers you need are available from people within your own organization—the CEO, the estimator or the contract negotiator—make a note of the explanation for your own reference during the project. If you or someone else in your company has to go to the other contractant (the project owner, the general contractor or, as in the case with a government contractor, the contracting agency) for the answer, be sure to get that answer in writing so that both parties understand how your question was resolved.

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A CONTRACT CHECKLIST

In general, you will have a good basic understanding of the project contract if you can readily answer the questions below. Many of these questions are discussed in detail in other sections of this manual.

- Who is your contract with?
- Who gives you orders?
- Who pays you?
- What kind of contract is it? (Expressed, implied, negotiated)
- What pricing method was used? (Lump sum, cost-plus-fee, unit price)
- What kind of job is it? (Federal government, state government, local government, institutional, public utility, commercial, industrial, overseas—each has its own set of requirements and circumstances)
- Who else is involved in the contract (design professionals, contract managers, subcontractors, suppliers, inspection agencies) and what are their qualifications or your past experiences with them?
- What permits and inspections are required? (in-plant, codes, etc.)
- What subcontracting work is included in the contract?
- Does the contract include any special labor requirements?
- How does the current union labor agreement affect labor requirements for the job?
- In broad terms, what does the contract say we must do? (Scope of work)
- What are the specific details of construction? (Special tool or equipment requirements, potential coordination problems, feasibility of design)
- What is the project schedule?
- What are the important administrative details? (Procedures for billing, approving change estimates and substitute materials, accepting work, back charges, getting compensation for delays, filing claims, etc.)
- Which contract clauses require special review? (Indemnity clause, lien release, cleanup, back charges, site facilities and conditions, contingent payment, etc.)
- Who determines the project schedule and how can the schedule be modified?
- What are the rules regarding payment? (How is work to be billed? Who reviews the bills? Who authorizes payments? How will retainage be paid? What are the conditions for final payment?)
- What is the procedure for changes? (Who has authority to approve changes? How are changes to be billed? When are changes to be billed? When will payments be made?)
- What happens if something goes wrong? (Who is liable for losses due to accidents, delays, changes? How will the amounts of claims be calculated?)
- What do other documents tell me about the original intent of the contract? (The original invitation to bid, the specialty contractor's proposal letter and bid records?)
- What is the procedure for presenting and resolving grievances?
- As project manager, what steps must be taken to make a fair profit on the job as described in the documents?

(NOTE: For additional information, refer to SMACNA or ASC contract manuals)

CONCLUSION

In most cases, the project manager has little or no control over the content of a contract. Nonetheless, he is the one who must meet its requirements yet still ensure his company a fair profit. Successful contract management begins with a thorough understanding of what the contract says and continues with the organization and implementation of the appropriate construction effort.

CHAPTER 13 BILLING PROCEDURES

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MAKING PROJECT BILLINGS MORE PROFITABLE

Last Saturday your next door neighbor, knowing that you're "in the air conditioning business," asked you to come by and check out a weird noise in his home air conditioning unit. You quickly discovered the problem—a minor malfunction requiring a $60 part and an hour's worth of work. Since your neighbor's a good friend, and since you're headed to the local hardware store anyway, you offer to buy the part for him and come by later to install it. He agrees to reimburse you in cash.

By early evening, the problem has been fixed and the air conditioner is quietly operating once again. You hand him the invoice for the part. Embarrassed, he tells you that he doesn't have the cash on hand, but he'll stop by tomorrow and pay you then.

The next day, you're taking your kids to a ball game. You need that cash you spent on the air conditioner part. By the time you have to leave for the game, however, your neighbor still hasn't reimbursed you. You're forced to stop by the local bank's money machine to make a withdrawal from your checking account. The withdrawal, you realize, drops your account balance below the level needed to avoid a service charge, but what choice do you have? So now you're out not only the $60, but also a $7.00 monthly service charge. To top it all off, you spent on the side trip to the bank made you late for the kickoff—a sin for which your kids won't forgive you until you buy them each a foot-long hot dog and soft drink (another $6.50).

In the confusion, you forget to record the teller machine withdrawal in your checkbook.

On Monday morning you call your neighbor. He's not home. In fact, you discover that he has gone on vacation for two weeks. You realize he's a good friend and this whole mess is just an oversight on his part and you're eventually going to get paid, but—

Meanwhile, your wife, unaware that you've withdrawn the $60, writes a check to pay a grocery bill—a check bigger than the account balance.

You get the idea.

The point of this anecdote is that there's a lot more involved in getting paid on time than just the amount of the bill. When a payment is late, it sets off a chain reaction. In business, this chain reaction can lead to losses of investment interest and supplier discounts and can literally eliminate the profit margin. This is especially true in the construction industry, where tight money and fierce competition force companies to keep their profit margins low in order to get work and then to rely on smart money management to keep from losing their shirts.

THE FOUR LAWS OF BILLING PROFITABLY

Following four simple laws ensures that your billing procedures don't lose money for you:

- Always bill for the full amount allowable (All direct, indirect, and impact costs)
- Always bill on time
- Always submit your bills in the exact format the payer wants, and
- Always manage your cash flow

DETERMINING THE FULL AMOUNT OF A BILL

Contract documents specify how you are to calculate the amount of each billing period's bill to the project owner. The procedures may be based on the project's specifications or a system devised by the project owner. Computation of the amount to be invoiced should be based on your job cost breakdown, and projected costs and over billing as defined below.

Establish Project Procedures for Efficient Billing

Whatever the system, learn it thoroughly and organize the project accordingly. If, for example, billing is to be based on percentages of work completed, be sure your foremen report their

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progress in terms of percentages of job completion.[1] If the number of installed units is the basis for billing, your field progress reports should provide exactly that information.

Include Projected Costs

Be sure to include projected costs in your billings. Let's say that you are preparing the bill on the 24th of the month. Your foreman reports that his crew is 84 percent finished on the condensate piping in one area of the project. Your own inspection confirms this. You and your foreman know, however, that by the last day of the month, when the project owner's representative inspects the work to make sure your bill is correct, the condensate piping will be 100 percent complete. Since the bill should reflect the work completed at the time the owner approves the bill, you should bill this job as 100 percent complete.

The same is true for equipment costs. You have a right to be paid for equipment delivered to the job site, even if it is not installed within the billing period. If you are preparing the bill on the 24th and you know that an air handler is being delivered on the 28th, be sure to include the cost for that air handler on your bill. If you don't, the project owner gets away with not paying for the equipment for at least 30 days, and your company has to dip into its own pocket to pay the supplier if it wants to earn the 10 day-pay discount. In effect, your company winds up financing the project owner's purchase of that air handler for 30-60 days—interest free—and it loses the investment interest it would ordinarily earn on that money.

Projecting costs is especially important at the beginning of a project, when your company has mobilization and start up expenses to pay, tools to buy, construction equipment to lease, the first month's wages to pay—all before getting the first payment from the project owner. To alleviate this burden and prevent the project from suffering a negative cash flow right from the start, bill the owner for these expenses up front—even before you begin actual construction work—so that you are reimbursed by at least the end of the first month. If you wait until the end of the first month of work to submit this bill, you end up financing these front-end costs for 60 days or more, interest free to the project owner.

Projecting costs each month can be a tedious, hit-or-miss affair, and because actual expenses vary over the course of the project, cash flow can vary dramatically from month to month. To make your job easier and ensure a steady and reliable income, sit down at the beginning of the project and determine how much you must bill the client each month. This simple calculation, based on your anticipated average monthly expenses and required monthly profit, will give you a basis for each month's bill. Using this figure as a starting point, you can adjust it upward each month to cover unanticipated costs.

The idea is to avoid what is called under-billing (submitting bills for less than the amount that you need to cover your actual and projected expenses) and to strive for over-billing (submitting bills that cover all your actual and projected expenses and provide a fair profit). This is the secret of profitable billing.

BILLING ON TIME

The contract documents state the duration of each billing period and the deadline for submitting the bill for each period. On most projects, the billing cycle is monthly and bills must be submitted no later than five days before the end of the month. The penalty for missing the deadline is simple: you don't get paid on time. The first rule, therefore, is to make sure that you submit each bill on time.

Your Own Schedule

The project owner's billing schedule is not the only one that affects the profitability of your billing procedures. Your own schedule affects it too. If every month you leave preparation of the bill to the last minute and then whip everyone into a frenzy to get something on paper so that

[1] A job is a unit of work within the project. It is a series of tasks involving a specific area or system and usually requiring one-two weeks to complete. For the purpose of control, resource management and efficient billing, each job involved in the project should be defined by the original project breakdown

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you don't miss the deadline, you're almost certainly losing profits due to missed billing opportunities.

Properly preparing a bill takes time. Information has to be gathered, verified, recorded in the proper format, tallied, and double-checked. Rushing the process leads inevitably to errors that are always in the project owner's favor. An owner will seize on a mistake in arithmetic or billing format to reject your bill and delay payment. Accidentally omitting or overlooking expenses is equivalent to giving the owner an interest-free 30-day loan.

To ensure a billing procedure that works for you instead of against you, you have to schedule preparation of the monthly bill just as you do every other project activity. You have to give your foremen, your accounting team, and yourself enough time to do a good job, and you have to assign everyone specific responsibilities that become a part of his monthly routine.

Modifications

Although the project's billing and payment schedules are established in the contract, they are not immutable. If during the course of the project you realize that the procedure is not to your best advantage, you should make every effort to change it. Shifting to a two-week billing cycle or arranging for separate billings for materials or equipment might offer advantages to the project owner as well as your company. If you can demonstrate the mutual advantages to the owner, you might be surprised at the result.

THE BILLING FORMAT

The project contract specifies the format in which all bills must be submitted. It's important for everyone involved in the billing process to be familiar with this format and to follow it in providing billing information. Information that doesn't fit the format can delay preparation of the bill. A bill that isn't exactly the way the owner wants is a ready excuse for delaying payment.

Reviewing a Draft Invoice

To avoid problems, leave enough time each month to prepare a draft bill (invoice) that can be reviewed by both your company's accounting team and the project owner or his representative. A review of the draft invoice by the project owner's team may seem an unnecessary step, but it carries several advantages. Specifically, it:

- Identifies and corrects format problems and mathematical errors without delaying payment
- Allows your company to explain how it arrived at the billed amounts
- Provides a forum for discussing and modifying the billing system, if necessary, and
- Projects an image of you and your company as thoroughly professional.

Any one of these advantages makes the time spent well worth it in the long run.

Changing the Format

Similar to the billing schedule, the billing format is prescribed by contract documents. In some cases, it is a format established by the architect/engineer or the project owner. In other cases, it can be a format normally used by the trade contractor. Either way, the format may be changed.

With the increasing use of computers in the construction industry, many companies are able to generate invoices quickly and accurately using their in-house software. The resulting savings can be a big advantage to the contractor and the project manager should explore the possibility of using the computer's invoice format as the billing format for the project. Here again, the project owner or his representative will most likely agree to a change if he is made to realize that it will streamline the billing review process.

CASH FLOW

After you have prepared your detailed trade construction schedule and had it approved by your client (general contractor or owner), review your cash flow for the project. Cash flow is the

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relationship between cash paid out (job costs) and cash received (receipts). Positive cash flow results when all expenses to be incurred by the end of the period (including all mark up) are reimbursed in full and all work completed is paid in full. Negative cash flow results when there are delays between the date the equipment is received (and must be paid for) and the date it is installed (and the customer is billed), with late submitting of bills to the customer, by under-estimating the percent completion of the project tasks, and by delays in billing for change order work. The objective is to keep the overdraft for the project as low as possible, or at zero or below (see Figure 13-1).

Maintaining positive cash flow from the first day of the project is very important. It enables the contractor to meet his expenses (payroll, equipment and material purchases, payments to subcontractors, other direct jobs costs (ODJCs), and administrative costs, etc.) without having to finance the project with company assets or loans.

Billing Procedures

The best insurance of a positive cash flow is a set of strict billing procedures. However, in general, good billing practices include all of the following:

- Submitting all bills on time and in the format specified by the customer
- Billing for all actual costs incurred up until the time the bill is prepared, including those based on percentages of completion and expenses for stored materials and equipment
- Billing for all costs that will be incurred by the time the bill is reviewed by customer, including those based on projected percentages of completion and end-of-month material and equipment deliveries
- Billing for general conditions, including mobilization, and
- Billing for earned overhead and profit
- Submitting partial bills for all time and material work as it is completed.

Over-billing

The ideal is to attain over-billed status. Over-billing is the practice of obtaining payment for expenses yet to be incurred or work yet to be done. It gives your company the funds it needs to meet weekly payroll costs, make necessary purchases, and cover some overhead expenses as they are incurred, instead of having to wait for payment. Among the methods used to over bill are:

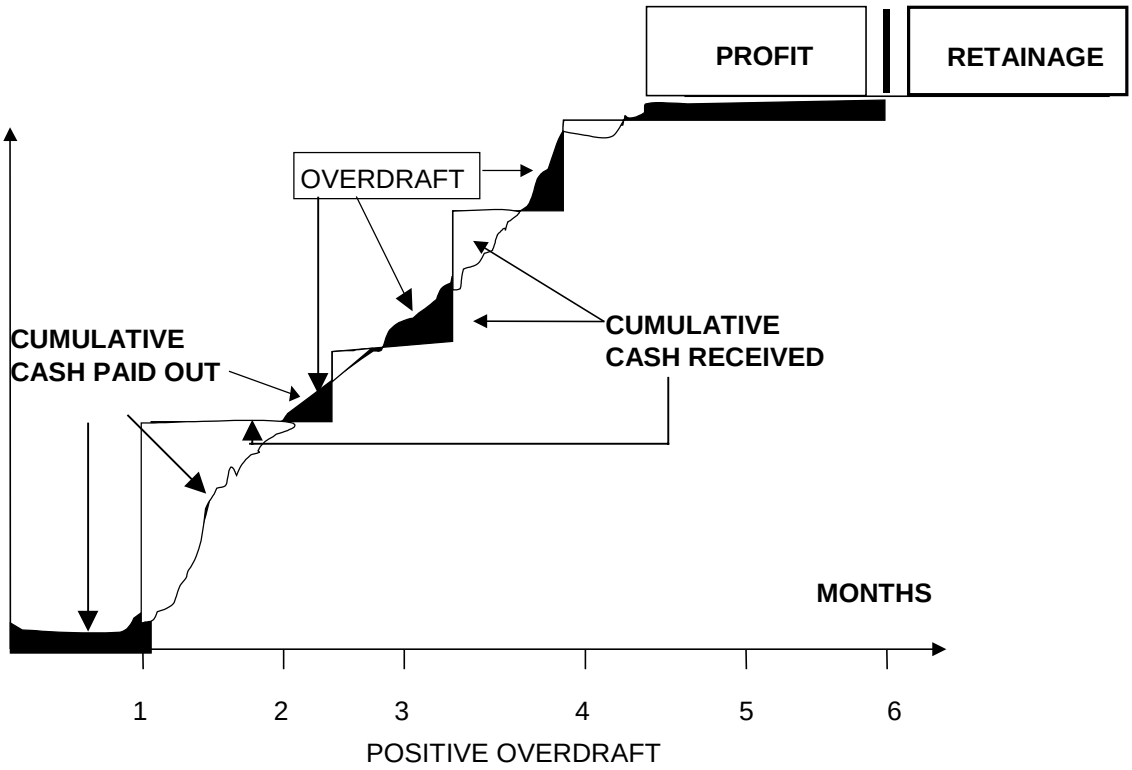
- Billing for anticipated costs
- Front-loading the project billing schedule, and
- Retain 10 percent on all subcontractor invoices until the company receives final payment from customer.

Collecting Receivables

It is important not only to bill your customer on time and for the full amount due but also insist on receiving payments on time. Be firm about this. Follow up on invoices when payments are not received on time. Be sure to negotiate reductions of retention as the job progresses and collect full retention when work is completed. Remember: over billing provides no advantages at all unless timely payment is received.

CONCLUSION

Billing is the activity that turns work into money. Like any other activity of the project, it must be scheduled, organized, and monitored in order to be profitable. The basic rules are completeness and accuracy, and by following them, the project manager can turn the billing system into a powerful tool for ensuring positive cash flow.



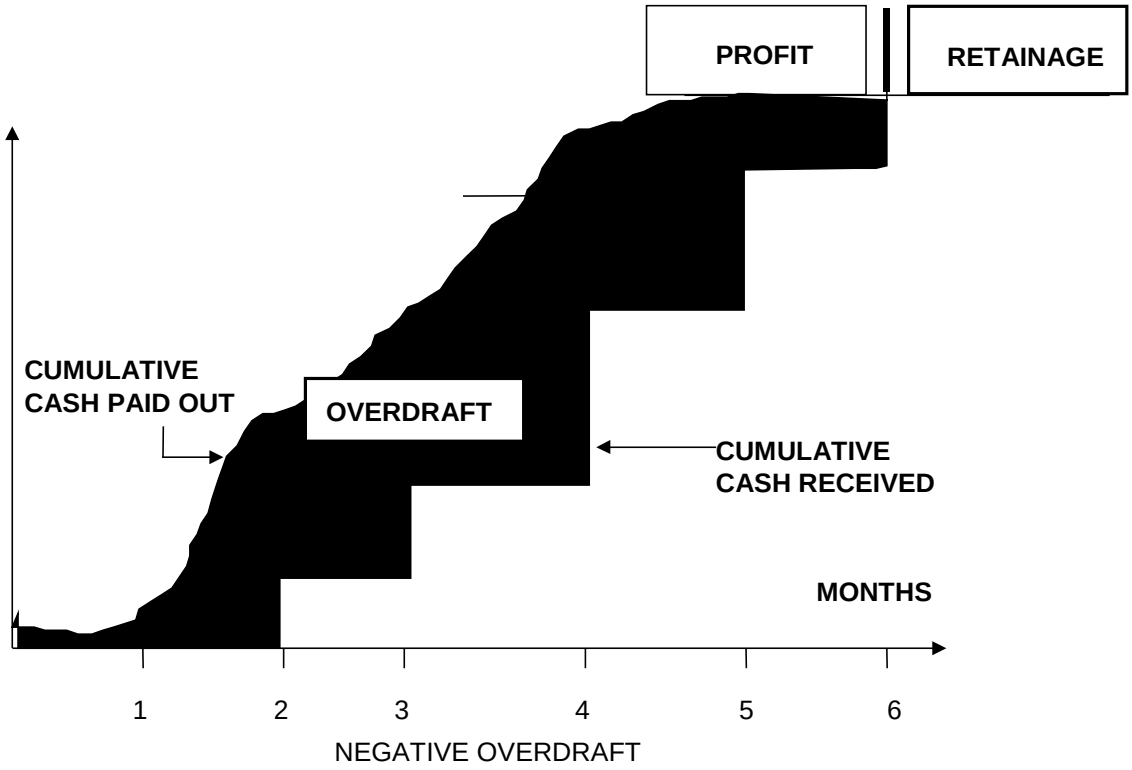


Figure 13-1 Sample Calculations of Overdrafts

CHAPTER 14 CHANGE ORDERS

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WHAT IS A CHANGE ORDER?

A change order is a written order issued after the contract has been awarded that either increases or reduces the scope of the contractor's work. A project owner or his engineer might issue a change order as a result of a change in the plans or specifications, or the correction of a design error. A general contractor might issue one for the same reasons or to adjust the work effort to an unforeseen situation on the job. Finally, the contractor himself might request one in order to improve or otherwise change the plan for his work, adjust to a given circumstance, or allow him to correct or work around another contractor's error.

Regardless of what the change order is for, or who issues it, it is bound to affect the contractor's bottom line. In a case where the change eliminates work included in the original contract, the contractor might lose the profit on that work, but he also saves the expenses. Assuming that the change does not affect other parts of the project, it has little overall effect.

It would seem that a change order that increases the contractor's work would also increase his profit. Indeed, it is one of the great myths of the industry that contractors get rich on change work. The fact is that a change, like every other aspect of the job, is profitable only if it is handled properly. Needless to say, change orders are often handled improperly.

CLIENT AGREEMENT ON CHANGE ORDER PROCEDURES

Since change orders will occur, it is better during the pre-construction phase to review and reach agreement with your client on the detailed procedures that will be followed for all changes in contract scope. This will prevent surprises and establish an agreement with your client, before any change occurs.

WHO IS RESPONSIBLE?

You, as project manager, are primarily responsible; however, if you are handling several jobs, you cannot be at the site 100% of the time. Therefore, you must depend on your field superintendent or foreman (the person in charge of day-to-day field activities for you). They must be well versed in the contract terms, the job scope, and the change order procedures, and should keep you advised of all change orders.

STANDARD PROCEDURES

To handle change orders profitably, your company must have standard written procedures and must insist that everyone follow them. These procedures must cover in detail:

- Identifying when a change order is needed
- Issuing requests for changes
- Processing requests for change work
- Estimating the costs of doing change work
- Obtaining approvals for changes
- Documenting change work progress and expenses, and
- Billing for change work.

Together, these points offer a structure for managing change work profitably. See Figure 14-1 for an example Lump Sum Change Order.

Obtaining Approval

Work on a requested change should not begin until the project manager has received written approval of his estimate for the work from the appropriate project authority. The appropriate authority is a person responsible for both approving change work estimates and authorizing payment for the work. The approval may take the form of a Change Order Contract, similar to the one shown in Figure 14-3.

NOTES

Occasionally, you may encounter a situation where the project authority will delay approving your estimate for one reason or another. Such delays can disrupt your construction schedule and affect the costs quoted in your estimate. To encourage quick approval of your estimate, include as a term of the estimate a deadline for approval and clearly state that, after that deadline, the estimate is subject to revision.

WHEN A CHANGE ORDER IS NEEDED

When a change order arrives on the project manager's desk from the general contractor or the owner, there is no question as to whether it is needed. However, not all requests for additional work are made formally. In the course of an inspection, a general contractor might ask your foreman to move, delete, or change work, representing a change from specifications or drawings. Such "informal" requests are not change orders, but they do raise the question of whether the contractor should ask for a formal change order to cover the requested work.

Essentially, a written change order is required any time a project authority (the general contractor, the project owner, the architect/engineer, etc.) requests the contractor to perform work outside the scope of the original contract. Some requests obviously involve work not included in the original contract. In other cases, it is not obvious, and the project manager must review the contract documents to make sure one way or another.

Responsibility for deciding whether an informal request requires a change order lies with the project manager, and he should make this point clear to his foremen. Every foreman should direct all informal requests to the project manager for his evaluation. The project manager might decide that a particular request represents a small enough task that he can do it as a "goodwill gesture" and not go through the hassle of a change order. A foreman, however, should not be given the authority to make such a decision.

In evaluating an informal request, the project manager should always refer to the contract documents. The contract, the plans and specifications, the invitation to bid, the bid proposal, the job estimate and break down in all of these offer clues as to whether a particular task is within the "intent" and well as the "letter" of the contract. Wherever there is doubt, the project manager should request a formal change order.

ISSUING REQUESTS FOR CHANGES

Some changes originate with the trades contractor himself. Perhaps a crew discovers that the physical layout of the job differs from the plans, and that what is supposed to fit doesn't. Or the contractor's engineer recognizes an opportunity to reroute a line or substitute a component to make installation easier without sacrificing quality. Or the purchasing agent comes across an unbeatable price on a lot of fixtures that are slightly different from, but in no way inferior to, those specified in the original plans.

Whenever a situation like this occurs, the project manager should immediately write a letter to the project authority, clearly stating and documenting the reason for requesting the change and outlining its advantages. If cost information is available at the time, it also should be included. It is then up to that authority to issue a change order and request final cost information.

"FAST TRACK" PROJECT DRAWINGS

Today more and more projects are "fast track" jobs—design-and-build projects planned and organized for quick completion. On most fast track jobs, drawings are created as work progresses and are changed frequently. If the job supervisor doesn't stay on top of these changes, they can easily get out of hand.

These changes can take several forms. Among them:

- New issues of individual drawings, usually submitted to the project team as prints or sepias
- 8-1/2" x 11" drawings that modify parts of existing drawings or add new areas to the project, and

NOTES

- Letters of Clarification answering questions that have come up among members of the project team—most often, questions about dimensions and other specific project details.

The project manager should make it clear to the job supervisor that, regardless of the form in which it is submitted, a change is a change and must be handled according to the company's established change order procedures. Specifically, the job supervisor must realize that:

- Each change on a fast track job can disrupt your work schedule and the schedule of your subcontractors, and
- Most changes mean extra work for your company and are therefore billable; as a result, the costs of doing them must be tracked carefully.

Procedures should be implemented to ensure that change work is properly performed, causes as little disruption as possible, and is fully billed to the project owner. The project manager, job supervisor, and any other member of the project team who might be involved should review every change request as it is received and identify:

- All costs your company will incur in performing the change work
- Any effect the change will have on other trades and, therefore, on your method or sequence of doing the job
- All basic modifications the change makes to the layout of the work (floor-to-ceiling elevations, number of rooms, wall thicknesses, etc.)
- When you should proceed with the change work
- Whether or not the change will require a time extension for the project, and
- How to coordinate the efforts of your crews and all subcontractors to accommodate the change.

PROCESSING REQUESTS FOR CHANGE WORK

All requests for change work, whether formal or informal, should be directed to the project manager. If the request is a written change order, the project manager should immediately begin evaluating it. Depending on the size of the order and its potential dollar amount, he might consult others who might eventually be involved, including the job foreman or superintendent, the shop foreman, the purchasing agent, and the accounting department. For a major change, the project manager may call a special meeting of the project team for a planning and evaluation session.

For an informal request, the project manager should refer to the contract documents, as mentioned above. If he cannot find a clear answer as to whether the request constitutes a change to the scope of work, he should consult with the project estimator and the company officers before making a decision.

ESTIMATING THE COSTS OF DOING CHANGE WORK

Behind the Paperwork

A change order states the scope and details of the work it authorizes. What it does not state is the impact the change might have on the project as a whole. For example, a given change might:

- Delay the progress of other parts of the job
- Increase material unit prices
- Increase time-related costs, such as construction equipment leases, for activities delayed by the change work
- Result in labor productivity losses (see Figure 14-2 for productivity loss factors)
- Alter the original completion date of the project
- Result in credit for overhead and profit for work reduction changes
- Disrupt manpower planning by changing the sequence of job activities
- Increase the cost of work in the base contract
- Interfere with the work of other trades

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- Increase supervision costs, or
- Increase overhead costs, both direct and indirect.

The project manager must consider these and all the other factors related to the project situation and determine their impact when estimating what to charge the project owner or general contractor to do the work. The contract margin must be maintained on the base contract and on the change order. A seemingly minor oversight can eliminate whatever opportunity for profit a change order offers.

It takes careful thought, an analytical mind, attention to detail and considerable experience to accurately determine all the costs involved in doing change work. It also requires a standardized company procedure (see Figure 14-1). The following pages offer forms that the project manager can use in estimating and submitting a lump sum change order. The project manager's company forms should be used, if available. Not all of the items listed in the forms will apply to every change order, however they are good checklists to be used to assure that no cost or possible cost is overlooked.

A PRACTICAL APPROACH

Every company has its own approach to estimating, and the project manager should use the one that is standard for his company. In general, estimating a change follows the same procedure as estimating any other type of work.

There are, however, some important points to keep in mind:

- Complete the estimate and submit the quote as soon as possible. The project owner is less likely to resist the added cost when the need for the change is still fresh in his mind.
- Whenever possible, specify a lump sum for the change. A lump sum change order requires accurate and detailed estimating up front but spares the project team the paperwork of tracking every piece of material and every hour worked—requirement of cost-plus change orders.
- Materials for the change work will probably be bought from a supplier's stock instead of factory lots. Material unit prices used in the estimate should reflect the increase in cost.
- Follow the contract documents in determining what is included in the "cost of work" and what markup percentage to use. Follow the company's guidelines on adding amounts for overhead and profit.
- A change estimate should include costs for additional bond premiums and warranty reserve allowances, where appropriate.
- Take into account any supplier restocking charge and the charge of shipping the materials back to the vendor when calculating credit for materials eliminated from the original contract.
- Where credits are involved, only direct and indirect costs are credited. Generally, no credit is given for overhead or profit.

Tracking a Cost-Plus Change

Inevitably, you will face situations where, because of time constraints or other pressures, you lack the opportunity to prepare an estimate and get a lump sum change order. Your only alternative is a cost-plus ("field authorized") change order, which involves keeping a careful accounting of your expenses in doing the work and submitting a bill when the work is completed.

Aside from the amount of paperwork required, a cost-plus change order has another disadvantage. It offers easy opportunities for oversights and omissions. Unless the project manager, superintendent, or job foreman is meticulous in his record keeping, something may potentially be left out of the bill.

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To guard against such oversights, assign someone (usually the job supervisor) full responsibility for recording all incurred expenses on a standardized form and:

- Emphasize to him the importance of tracking all direct and indirect costs of the work
- Follow up to ensure that he is keeping complete and accurate records of expenditures, and
- For large changes, assign the work a separate labor code and material code to assist field and office personnel in tracking expenditures.

For reference purposes, the following pages contain a sample Field Authorized Change Order Contract (see Figure 14-3) and a sample Extra Work Daily Recap Form (see Figure 14-4). There is a sample list of expendable items that should be tracked while performing cost-plus change work (see Figure 14-5). Again, these samples should be replaced with your company's standard forms, if available.

DOCUMENTING CHANGE WORK

No matter how minor the construction tasks involved, a change order requires careful documentation. For cost-plus and lump sum change orders, the paperwork can be tedious. Regardless, your records must be accurate and complete. An important part of documentation is a written notification, to the general contractor/owner/client of receipt of a change order or change request and that the impact on cost and schedule will be issued as soon as it is available.

Each change order should be assigned a control number and a separate file as soon as it is received. It should also be recorded on a Change Order Log sheet (see Figure 14-6). The log tells everyone at a glance the status of each change request, whether it has been approved, and how it affects the contract's bottom line.

Among the documents filed for each change should be:

- The original change request
- The change estimate
- The project authority's written approval to proceed
- The memo to all project team members notifying them of the change
- Minutes or notes of any meetings held regarding the change
- All cost tracking forms and data
- All permits, inspection reports and testing results relating to the change, and
- A copy of the final invoice to the customer.

Other documents should be prepared once a change order is approved and underway. Specifically, the project manager should prepare or have prepared:

- A revised job estimate reflecting the effect of the change
- A forecast of the impact of the change on the project's profit, and
- A revised job schedule.

BILLING FOR CHANGE WORK

The costs of change work should be tracked in the project's overall cost control and accounting system; however, invoices for change work should be prepared and submitted separately from the regular monthly billings in order to make record keeping easier. The invoices should be in the same format as those used for the monthly billings and reviewed using the same procedure used for all billings. Pay special care to accuracy, thoroughness, and complete documentation.

CONCLUSION

Change orders are a fact of life. They are disruptive and annoying, but at the same time offer opportunities for increasing profits. Whether or not a project manager can take advantage of these opportunities is largely a matter of how well he and the members of his team take control of each change order request and manage it to their advantage.

Alliance COR #	
GC Reference #	
Owner Ref. Num. :	**Owner Req**

Date : **5/14/97**

To : **General Contractor**
Address
Address

Attention: **Project Manager**

Reference: **Project Name**
Project No.

Description: **(Describe Work Here)**

We have reviewed the requirements of the above referenced documents as they pertain to our contract. In compliance with the terms of our subcontract agreement, we agree to perform the changed work for;

_____ Additive amount of: [ ]

_____ Deductive amount of : [ ]

_____ If change is not authorized:

[ ] Quotation is valid for thirty days
[ ] [ ] Working days extension of contract time is required, any other costs for such extension we be separate of this correspondence.
Exclusion or conditions that vary from our contract agreement are as follows:

[ ] This work will not proceed until NTP is issued.
[ ] Complete pricing breakdown for our work is attached for your review.
[ ] Standard conditions on page two of this form apply.

Please respond to the above referenced change proposal number when responding to this quotation.

The payment requested in this change estimate does not include any amounts for changes in sequence of work, delays, disruptions, or impact costs due to the accumulative effect of this change with other changes or any other reason and our rights are expressly reserved to make claim for any and all of these related items or costs prior to final payment upon this contract.

Alliance, Inc.

_____
Alliance Project Manager

cc:

Figure 14-1 Example Lump Sum Change Order (Sheet 1 of 12)

1	The work presented in this proposal is consistent with Alliance Inc.'s base contract scope of work. Any terms conditions, exclusions and clarifications of the base scope of work. Any terms conditions, exclusions and clarifications of the base estimate cost detail.
2	All pricing contained in this proposal is contingent on receipt of written notice to proceed within 30 calendar days from the date of this proposal, otherwise this proposal is subject to price adjustment or cancellation.
3	Changes proceeded upon by Alliance Inc. at the direction of General Contractor, or the Owner shall be immediately billable to XX% on commencement of the work.
4	Progress payments delayed for work contained in this proposal, caused through no fault of Alliance, Inc., or may cause suspension of the work.
5	This proposal is predicated on the logical implementation of the added work into the Project Construction Schedule. Unless designated otherwise, this proposal is based on installation performance at an optimum, productive and uninterrupted manner.
6	We do NOT include in this change estimate any costs for removing, replacing or alteration to NON-mechanical/electrical work required of other trades unless specifically designated in the change estimate cost detail. We reserve the right to reassess the impact of any NON-mechanical/electrical drawing revisions or supplement should the effects thereof not be reflected on a future mechanical/electrical drawing or specification revision, or change request presentation.
7	We do not include in this change estimate any costs for work mandated by construction procedures implemented by other trades unless specifically designated in the change estimate cost detail.
8	This proposal specifically excludes any cost impacts caused by this change estimate, or aggregates of change estimates, on progress of the Base Contract Original scope of work.
9	In the advent that this change delays the completion and acceptance of the Project, associated delay, cost, inclusive of extended overhead costs, Retention finance costs, etc., are specifically NOT included in this change estimate proposal.
10	Should the words 'engineering' appear in this proposal, Alliance Inc. specifically excludes any and all liabilities, including adequacy of design or time impacts, related thereto, unless specifically designated otherwise in the same contract AND the change estimate cost details.
11	This estimate excludes all costs related to Asbestos Abatement, Asbestos Safety Apparatus and Procedures, or Hazardous Substance Abatement unless specifically designated in the change estimate details.

Figure 14-1 Example Lump Sum Change Order (Sheet 2 of 12)

	CHANGE ORDER COST SUMMARY			
	DESCRIPTION OF COST	**LABOR**	**MATERIAL**	**TOTAL**
1	Equipment (from page X)			
2	Material Costs (from page X)			
3	**Subtotal item 1+2**			
4	Freight, other delivery charges			
5	**Subtotal item 3+4**			
6	Material Return & Cancellation			
7	Other direct costs (from page X)			
8	Equipment & tool use (from page X)			
9	Gas and Oil (form page X)			
10	**SUBTOTAL =**			
11	Labor costs (from page X)			
12	**SUB-TOTAL =**			
13	**TOTAL COSTS BEFORE SUBCONTRACTS =**			
14	Warranty Reserve @	of line 13		
15	Subcontracts (from page 10)			
16		of lines 13, 14		
17	Overhead @	of lines 13, 14		
18	Profit @	of lines 13, 14		
19	Subcontracts Profit @	of line 15		
20	**TOTAL COSTS AND PROFITS BEFORE BONDS, INSURANCE & OTHER COSTS**			
21	Bonds, Subcontractors			
22	Bonds Performance and Payment @	of line 20		
23	Shop Burden @ (See S/M take-off sheets)			
24	Special Insurance and other charges			
25	Extended overhead (from page X)			
26	**TOTAL PRICE OF CHANGE PROPOSAL =**			

27	Extension of time because of this change order is:		**Work Days**
			Activity ID

28	This proposal is based on:		Straight time
			Overtime
			Shift Work

29 This proposal is VOID unless a written change order or written Notification to Proceed is received by : _____

30	Extended Overhead Costs :	Included	
		Deferred*	
		N/A	

Submitted By: _____ **Date:** _____

Approved By: _____ **Date:** _____

* Extension of time deferred is to be applied in proper schedule sequence to each category of work

Figure 14-1 Example Lump Sum Change Order (Sheet 3 of 12)

	COST ESTIMATE / EQUIPMENT & MISC.		
QUANTITY	**EQUIPMENT**	**Labor Hrs**	**Equipment $**
	PLUMBING		
	Plumbing Totals:		
	HVAC / WET		
	HVAC / Wet Totals:		
	SHEET METAL		
	SHEET METAL Totals:		
	EQUIPMENT SUB-TOTAL =		

Sales Tax @		=	
Dryage @		=	
Escalation @		=	
Startup, Test & Punch @		=	

Total Equipment Cost =

Total Equipment Hours =

Figure 14-1 Example Lump Sum Change Order (Sheet 4 of 12)

	COST ESTIMATE ROUGH MATERIAL		
QUANTITY	**Rough Material**	**Labor Hrs**	**Material**
	PLUMBING		
	Plumbing Totals:		
	HVAC / WET		
	HVAC / Wet Totals:		
	SHEET METAL		
	Startup and Test		
	Punchlist		
	Material Handling		
	Clean-up		
	SHEET METAL Totals:		
	ROUGH MATERIALS SUB-TOTAL =		

Consumable @		=	
Sales Tax @		Mat + Consum	
Dryage @		=	
Escalation @		=	
Startup, Test & Punch @		=	

Total Rough Material Cost =	
Total Rough Material Hours =	

Figure 14-1 Example Lump Sum Change Order (Sheet 5 of 12)

OTHER DIRECT COSTS				
ITEM	**% Labor**	**Quantity**	**Rate**	**Total**
Resident Management and Expenses				
Superintendent Expenses				
Other Non-manual Labor Expenses				
Field Office Management and Expenses				
Estimating and Cost Analysis Expense				
Labor Planning (SLP) and Expenses for Update				
Field Engineering, Detailing, Repro., Supplies, and Expenses				
Purchasing, Expediting, Traffic and Expense				
Inventories, Management and Expense				
Tools and Equipment management Expense				
Payroll Management, timekeepers and Expense				
Secretaries, Clerk Typist, and Expenses				
Welding Qualification and Expense				
Welding Inspection and Testing (NDB)				
Instruction of the Owners Personnel / O&M Manuals				
CPM Scheduling or Update				
Revise As-built Drawings				
Progress Photos				
Parking Expense				
Permits, Licenses, Fees, Dues				
Extraordinary Estimating Expenses				
Engineering or design Expense				
Deliveries, COMPANY				
Special Freight Charges				
Temporary wiring				
Temporary Power				
Temporary Heat				
Temporary Water				
Temporary Toilets				
Temporary Air				
Temporary Weather Proofing				
Temporary Site Work				
Safety Barricades, Gates, other materials				
Ventilation				
Tags, Charts, and Identification				
Office Furniture and Equipment				
EDP Cost				
Prefabrication Facilities				
Storage Facilities - On Site				
Storage Facilities - Off Site				
Office heat and electricity				
Office telephones				
Copier Expense and office supplies				
Warranty Reserve				
Contingencies				
Sales Tax on Applicable Items Above				
TOTAL, OTHER DIRECT COSTS=				

Figure 14-1 Example Lump Sum Change Order (Sheet 6 of 12)

EQUIPMENT AND TOOL USE				
EQUIPMENT	**Rate**	**Period**	**Quan/Dur**	**Cost**
Automobile				
Panel Van				
Pick-up Truck				
Stake-Body truck				
-- 1 1/2 Ton				
-- 1 1/2 Ton W/A - Frame and Winch				
Flat Bed Truck - 2 Ton				
Hydralift Truck				
Crane - 140 Ton - 170 ft. boom				
Motor Crane - 25 Ton				
D-6 Crawler Tractor				
Backhoe				
Trenching Machine				
Air Compressor				
Gasoline Driven Welding Machine				
Electric Motor Driven Welding Machine				
Heliarc Welding Machine				
Acetylene rigs, Complete				
8" - Pipe machine				
4" - Pipe machine				
2" - Pipe machine - Power Vise				
Pipe Bending Machine				
Metal Cutting Band Saw				
Cut-Off Saw				
Power Hoist				
Water Pump				
Trailer Van				
Portable Building				
Dewatering Equipment				
Fork Lift				
Scissor Lift SL-22 Electric High Reach				
Knuckle Boom TBA-50R-Gas				
Scaffolding				
Other				
Total Equipment and Tool Use =				
Gas and Oil Usage =				

Figure 14-1 Example Lump Sum Change Order (Sheet 7 of 12)

	LABOR SUMMARY						
JOB DESCRIPTION	**BASE RATE**	**FRINGES**	**PRK/TRVL SUBSIS**	**WAGE ESCAL.**	**ZONE PAY**	**PT & I**	**TOTAL**
Sheet Metal	**Effective: x/x/xx thru x/xx/xx**						
Apprentice							
Journeyman							
Foreman							
Gen. Foreman							
Superintendent							
Plumber / Fitter							
Apprentice							
Journeyman							
Foreman							
Gen. Foreman							
Superintendent							
Laborer							
Project Manager							
Secretary							

1	Sheet Metal Journeymen Hours	(See pages X, & Attached T/O)	
2	Plumber / Fitter Journeyman Hours	(See pages X, & Attached T/O)	
3	Material Handling	of Lines 1 & 2	
4	Non-Productive Labor	of Lines 1 & 2	
5	Safety	of Lines 1 & 2	
6	Clean-up	of Lines 1 & 2	
7	EEC/Implementation, Training	of Lines 1 & 2	
8	Equipment Repair	of Lines 1 & 2	
9	Height Factor	of Lines 1 & 2	

BASE JOURNEYMAN HOURS =

Figure 14-1 Example Lump Sum Change Order (Sheet 8 of 12)

	LABOR SUMMARY / CORRECTIONS				
	LABOR CORRECTIONS		**Affected Hours of Current Contract**		**Man-hours of Proposed Change**
10	Percentages are to be applied to the total affected man-hours of the current contract and to the labor of the proposed change	Manhrs.... As Of			
NEGATIVE PRODUCTIVITY FACTORS	*(Refer to Appendix A)*	**% of Loss CC**	**Hrs Lost CC**	**% Loss PC**	**HRS Lost PC**
11	Stacking of Trades				
12	Morale and attitude				
13	Reassignment of Manpower				
14	Crew size inefficiency				
15	Concurrent operations				
16	Dilution of Supervision				
17	Learning Curve				
18	Errors and Omissions				
19	Beneficial Occupancy				
20	Joint Occupancy (other trades)				
21	Site Access				
22	Out of Sequence Work (Other Trades)				
23	Ripple				
24	Overtime Adjustment				
24	**SUBTOTAL**				
25	**TOTAL CORRECTION**				
		Total Hours with Corrections			
	HOURS AND LABOR AMOUNT		**HOURS**	**RATE**	**TOTAL**
26	S/M Journeyman	Total Hours			
27	S/M Foreman	Total Hours			
28	S/M Gen Foreman	Total Hours			
29	Plumber/Fitter Journeyman	Total Hours			
30	Plumber/Fitter Foreman	Total Hours			
31	Plumber/Fitter Gen Foreman	Total Hours			
32	Laborer	Total Hours			
33	Operator				
34	Teamster				
35	Millwright				
36	Quality Assurance	Total Hours			
37	Other				
38	**TOTAL DIRECT LABOR =**				
39	Tool Replacement				
40	**TOTAL LABOR**				

Figure 14-1 Example Lump Sum Change Order (Sheet 9 of 12)

SUBCONTRACTS

SUBCONTRACT	**Sub Hrs**	**Quote**
Temperature Controls		
Insulation		
Plumbing and HVAC Piping		
Air and Water Balance		
Excavation		
Rigging		
Core Drilling		
Non Destructive Testing / Visual Inspection		
CPM Scheduling and Update		
Other		

TOTAL SUBCONTRACT COSTS =

Figure 14-1 Example Lump Sum Change Order (Sheet 10 of 12)

EXTENDED OVERHEAD CALCULATION

EXTENDED OVERHEAD	Quan	Cost	Total

TOTAL EXTENDED OVERHEAD =

Figure 14-1 Example Lump Sum Change Order (Sheet 11 of 12)

SPECIAL TERMS AND CONDITIONS

EXCLUSIONS AND CONDITIONS

1. We exclude any cutting, patching or painting required for this work.
2. We exclude any and all demolition and subsequent clean up.

Figure 14-1 Example Lump Sum Change Order (Sheet 12 of 12)

	Percent of Loss if Condition:		
	Minor	Average	Severe
1. STACKING OF TRADES: Operations take place within physically limited space with other contractors. Results in congestion of personnel, inability to locate tools conveniently, increased loss of tools, additional safety hazards, and increased visitors. Optimum crew size can not be utilized.	10%	20%	30%
2. MORALE AND ATTITUDE: Excessive hazard, competition for overtime, over-inspection, multiple contract changes and rework, disruption of labor rhythm and scheduling, poor site conditions, etc.	5%	15%	30%
3. REASSIGNMENT OF MANPOWER: Loss occurs with move-on, move-off men because of unexpected changes, excessive changes, or demand made to expedite or reschedule completion of certain work phases. Preparation not possible for orderly change.	5%	10%	15%
4. CREW SIZE INEFFICIENCY: Additional men to existing crews “breaks up” original team effort, affect labor rhythm. Applies to basic contract hours also.	10%	20%	30%
5. CONCURRENT OPERATIONS: Stacking of this contractor’s own force. Effect of adding operation to already planned sequence of operations. Unless gradual and controlled implementation of additional operations made, factor will apply to all remaining and proposed contract hours.	5%	15%	25%
6. DILUTION OF SUPERVISION: Applies to both basic contract and proposed change. Supervision must be diverted to (a) analyze and plan change, (b) stop and replan affected work, (c) take off, order and expedite material and equipment, (d) incorporate change into schedule, (e) instruct foreman and journeyman, supervise work in progress, and (f) revise punch lists, testing, and start-up requirements.	10%	15%	25%
7. LEARNING CURVE: Period of orientation in order to become familiar with changed condition. If new men are added to project, effects more severe as they learn tool locations, work procedures, etc. Turnover of Crew	5%	15%	30%
8. ERRORS AND OMISSIONS: Increases in errors and omissions because changes usually performed on crash basis, out of sequence or cause dilution of supervision or any other negative factors.	1%	3%	6%
9. BENEFICIAL OCCUPANCY: Working over, around, or in close proximity to owner’s personnel or production equipment. Also badging, noise limitations, dust and special safety requirements, and access restrictions because of owner. Using premises by owner prior to contract completion.	15%	25%	40%
10. JOINT OCCUPANCY: Changes cause work to be performed while facility occupied by other trades and not anticipated under original bid.	5%	12%	20%
11. SITE ACCESS: Interference with convenient access to work areas, poor man-lift management or large and congested work sites.	5%	12%	30%

Figure 14-2 Factors Affecting Productivity (Sheet 1 of 2)

	Percent of Loss if Condition:		
	Minor	Average	Severe
12. FATIGUE: Unusual physical exertion. If on change order work and men return to base contract work, effects also affect performance on base contract.	8%	10%	12%
13. RIPPLE: Changes in other trades' work affecting our work such as alteration of our schedule. A solution is to request, at first job meeting, that all change notices/bulletins be sent to our Contract Manager.	10%	15%	20%
14. OVERTIME: Lowers work output and efficiency through physical fatigue and poor mental attitude.	10%	15%	20%
15. SEASON AND WEATHER CHANGE: Either very hot or very cold weather.	10%	20%	30%

NOTES:

1. A study of these productivity factors may be helpful in preparing original estimates and change orders. In fact, introduction of a given factor or job condition producing a degree of effect on productivity, may well trigger a change order.
2. The individual items and titles proposed cover a description of conditions without necessarily including each detailed condition that may be involved. The values are a percentage to add onto labor costs, of change and in some cases, original contract hours.

These factors listed are intended to serve as a reference only. Individual cases could prove to be too high or too low. The factors should be tested by your own work experience and modified accordingly in your own use of them, since percentages of increased costs due to the factors listed are necessarily arbitrary and may vary from contractor to contractor, crew to crew, and job to job.

Figure 14-2 Factors Affecting Productivity (Sheet 2 of 2)

CHANGE ORDER

To: _____ Subcontract No.: _____

Change Order No.: _____

Date: _____

This CHANGE ORDER is to your subcontract with Alliance Contracting, the Contractor, dated _____

for project, _____ for _____

You are hereby requested to make the following changes, additions, or deletions under your subcontract:

1. Change Order No. 2 - Provide insulation on generator exhaust system, per your quote dated _____.
   $

2. Change Order No. 3 - Accomplish revisions to double door opening into new structure, per your quote dated _____.
   $

3. Provide labor & material to form and pour concrete transformer pad, per your verbal quote dated _____.
   $ _____

Total Change Order **$** _____

Except for such CHANGES as are set forth herein, all of the terms and conditions of your SUBCONTRACT, and as may have been heretofore modified in writing, shall remain the same. It is understood and agreed that the acceptance of this modification by the subcontractor constitutes an accord and satisfaction and represents payment in full (both time and money) for all costs and/or delay, if any, arising out of, or incidental to, the work as herein revised and any impact that this change may have upon the unaffected work.

INCREASE -- ~~DECREASE~~ by reason of this CHANGE ORDER ..... **$** _____

ORIGINAL subcontract amount ..... **$** _____

PREVIOUS change orders ..... **$** _____

NEW TOTAL SUBCONTRACT AMOUNT ..... **$** _____

The foregoing Change Order Is ACCEPTED upon the terms and conditions above stated and those in the original SUBCONTRACT.

_____
Subcontractor

ALLIANCE CONTRACTING
Contractor

_____
By:

_____
By: Project Manager

NOTICE TO SUBCONTRACTOR: This Change Order must be signed and returned within 5 days to Contractor.

Figure 14-3 Sample Field Authorized Change Order Contract

ALLIANCE CONTRACTING

EXTRA WORK DAILY RECAP

Job Name _____ Job No. _____ Date _____ Sht ___of___

Work Description _____

_____

_____

Authorization Reference _____

LABOR SUMMARY

NO.												
EMPLOYEE NAME												TOTAL HOURS BY COST CENTER
COST CENTER & DESC.	ST OT	ST OT	ST OT	ST OT	ST OT	ST OT	ST OT	ST OT	ST OT	ST OT		
TOTAL HOURS BY EMPLOYEE												

SMALL TOOLS CHARGED AT ____ % OF DIRECT LABOR

MATERIAL & SUBCONTRACTOR RECAP

QTY	DESCRIPTION	QTY	DESCRIPTION

ATTACH ADDITIONAL MATERIAL SHEETS IF NECESSARY

EQUIPMENT USAGE

DESCRIPTION	Hrs.	DESCRIPTION	Hrs.	DESCRIPTION	Hrs.	DESCRIPTION	Hrs.
Pickup Truck		Compressor		Pipe Machine		Office Trailer	
Crane Truck		Trencher		Pipe Bender			
Bucket Truck		Equipment Trailer		Core Drill			
Backhoe		Trash Pump		Rotohammer			
Dump Truck		Welding Machine		Generator			
Compactor		Bobcat		Wire Puller			

Approved By _____ Submitted By _____

Owner _____ Alliance Contracting

Date _____ Date _____

Figure 14-4 Sample Extra Work Daily Recap Form

TYPICAL EXPENDABLE ITEMS	
It is the general practice of our industry to charge these items of cost to a job as a part of the material cost of the job, or as items of direct job expense.	
Abrasive Cutoff Discs	Other Fuels
Acetylene	Other Inert Shield Gases
Argon	Other Inert Test Gases
Brushes (paint, wire, fitting)	Other Lubricants
Chisels	Other Printed Forms
Cleaning Fluids	Other Solvents
Cleanout Plugs	Oxygen
Cutting Oil & Paste	Paste Brushes
Cutting and Welding Tips	Pipe Cutter Wheels
Diamond Core Bits	Pipe Dies
Drill Bits-Diamond & Steel	Pipe Joint Compounds
Emery Cloth	Propane
Emery Wheels	Ramset Charges
Files	Rod Dies
First Aid Kit Supplies	Sand Cloth
Flux	Sandpaper
Foul Weather Gear	Solder
Gasoline	Star Drills
Gloves, Soapstone	Time Charge Tickets
Grinding Wheels	Tip, Cutting
Hacksaw Blades	Tip, Cleaners
Hole Saw	Tip, Welding
Kerosene	Tool Handles
Material Charge Tickets	Tungsten Tips
Motor Oil	Twist Drills
Naphthalene	Welding Hood Lens
Nitrogen	Welding Rod
Other Abrasives	Wiping Cloths and Rags
Other Drill Bits and Saws	Wire Brushes
While this list is by no means complete, it is intended to give a representative cross section of the type of items which may be classified as “Expendable Items.”	

Figure 14-5 List of Expendable Items to be Tracked While Performing Change Work

CHANGE ORDER LOG (COL)

Print Date: 2-Dec-97

ALLIANCE JOB NO: _____ **PROJECT:**_____ Page __ of __

DATE	COP	FA	RFI		DESCRIPTION OF WORK	MADSEN C.O. NO.	AMOUNT	DATE SUBMTD	DATE APPV'D	C.O. NO.	AMOUNT OF C.O.	
					ORIGINAL CONTRACT AMOUNT							
2-Dec-97					**REVISED CONTRACT AMOUNT**	Submitted: $0				Approved	$0	**$0**

Outstanding Proposals:$0 Percent Change to Contract (Approved CO's): 0.00%

Figure 14-6 Sample Change Order Log

NOTES

CONTROLLING A MAJOR VARIABLE

Labor costs are the major variable in construction work, and accurate labor reporting is the only way of tracking and controlling them. Without labor reports, your company has no way of knowing whether the labor hours being used on the project are within the original estimate and therefore, whether the project is profitable.

THE PROJECT MANAGER'S RESPONSIBILITIES

Labor reports are the basis of the job cost control system that the project manager uses to make major management decisions. If the reports turned in by the job supervisor are incorrect or incomplete or if the accounting department makes errors in recording the reported information, the entire job cost control system is thrown out of kilter. The results can be costly, especially if the mistakes go unnoticed until the end of the project, when it is often too late to take corrective action.

The project manager's primary responsibility, then, is to make sure all labor information that comes in from the field is accurate and complete and that it is entered properly into the accounting system. You can do this by:

- Being certain that everyone on the project team, particularly the job supervisor, is familiar with the tasks and labor codes for the project
- Insisting that the job supervisor keep a separate record of labor hours by code. Labor hours usage should be recorded daily on a standard form provided by the company (see Figure 15-1) and use his records to verify the codes and hours on each worker's time card. He must not rely on his memory and wait until the end of the pay period to create his labor record!
- Ensuring that the job supervisor gets each worker to record his labor hours daily on his time card (see Figure 15-2) and not wait until the last day of the pay period to "remember" what he did each day
- Reviewing (or assigning someone to review) all labor reports and time cards as they arrive from the field to make sure the project's name and number appear on each of them
- Requiring the job supervisor to inform you immediately when he knows that the labor hours on a particular task will exceed the original estimate
- Requesting that the job supervisor get instructions from you when he feels that a certain task does not fit any of the codes assigned to the project
- Requiring the job supervisor to check and recheck each time card and labor report before submitting it to ensure that each code and number of hours is correct and to avoid errors such as charging labor hours to equipment labor codes, etc.
- Insisting that labor hours spent on cost plus (time and materials) change work be recorded separately, using the appropriate codes, and
- Making sure the job supervisor does not try to avoid "looking bad" by diverting some of the hours from an overrunning cost code to a code which may otherwise come in under estimate.

CONCLUSION

Enforcing strict reporting procedures almost guarantees the project manager that the labor information he receives is accurate—a major step toward controlling job costs and maintaining the project schedule. These procedures rely on familiar elements: assigning specific responsibilities, making sure that the people responsible know what is expected of them, and providing standard forms for the paperwork involved.

LABOR REPORTING FORM						
DATE				JOB NO.		
JOB NAME						
JOB CONDITIONS						
	Are we delaying anyone?	Yes	No	Material from shop?	Yes	No
	Is anyone delaying us?	Yes	No	Is list attached?	Yes	No
	Any accidents of any kind?	Yes	No	Any deliveries?	Yes	No
	Who?			Was material damaged?	Yes	No
	What?			Is packing list attached?	Yes	No
	Any changes made?	Yes	No	Truck Trips? Shop		
	By whom?			Job Truck		
	SUBCONTRACTORS ON JOB:			Any material returned for credit?	Yes	No
				To whom?		
				Why?		
	Any tools broken or problems with any?	Yes	No	Is material from trucks list attached?	Yes	No

MEN & HOURS	P.O.'s

EQUIPMENT	

COMMENTS	

ALLIANCE, INC.
OWNERS REPRESENTATIVE
FILLED OUT BY (SIGN)

Figure 15-1 Sample Job Supervisor's Labor Reporting Form

WEEKLY TIME TICKET

EMPLOYEE NAME: _____ EMPLOYEE NO.: _____ WEEK ENDING: _____
DATE

DAY	JOB NAME	JOB NUMBER	CRAFT	COST CODE	G/L ACCOUNT NUMBER	TYPE *	HOURS				FOR OFFICIAL USE ONLY		
							REG.	O.T.	DBL. TIME	TAMP	OTHER HOURS	SHOP	OTHER RATES
TUE													
TUE													
TUE													
WED													
WED													
WED													
THU													
THU													
THU													
FRI													
FRI													
FRI													
SAT													
SUN													
MON													
MON													
MON													
					TOTAL HOURS BY CLASSIFICATION								
											TOTAL HOURS		

_____ APPROVED BY FOREMAN

_____ EMPLOYEE SIGNATURE

* TYPE FIELD (F), SHOP (S)

Figure 15-2 Sample Time Card

CHAPTER 16 JOB COST CONTROL

NOTES

COSTS AND PROFITS

Job cost control affects far more than the project itself. It is the basis of financial planning for the entire company, because the company gauges its financial health on the profitability of each project it undertakes. If the information provided by the system is reliable, the benefits it brings to the project are shared throughout the company. If errors slip through, however, they can lead the company's financial planners into decisions that can have a devastating impact on the entire company's future.

Every project has a budget based on the job estimate. The budget specifies how much the project team can spend for everything it needs to complete work—equipment, materials, subcontractors, labor, and other direct job costs such as rental of tools and construction equipment, job site trailers, security equipment, utilities, etc. A budget is an indispensable tool. Unfortunately, most project managers use only half of its potential. They use it to track how much they spend. They forget that it can also track how much profit they make. This is a serious mistake, because earning the maximum fair profit on every job is the project manager's responsibility and not fully using the tools that can help him puts him at a disadvantage right from the start.

THE OBJECTIVES

There are four objectives of job cost control:

- Monitor planned, incurred, and anticipated project expenditures
- Control the cost of construction
- Provide ongoing forecasts of the project's financial outcome, and
- Maintain effective records that provide the results of good and bad estimates so that adjustments can be made in labor productivity factors and methodology.

Notice that all are management objectives. None aims at simply "documenting" costs, although that is certainly a part of job cost control. Instead they form a system that tells the project team where the job stands financially at any given moment and provides an early warning system for identifying and correcting profit-threatening situations before they can become crises.

GROSS MARGIN

Gross project margin is often confused with company profits. Gross project margin is simply the difference between the selling price and the total direct job costs.

DIRECT JOB COSTS

Direct job costs can be defined as follows:

- Equipment to be installed, considered a nonvolatile (fixed) cost since it rarely varies from what is stated in the estimate
- Subcontracts, also considered a nonvolatile cost
- Materials, considered a semi-volatile cost with a possible variation of ±10% over the cost of the project
- Labor, considered a very volatile cost
- Other Direct Job Costs (ODJC), considered a volatile category since it involves a lot of "guesstimating."

ODJC are job overhead costs-expenses incurred as part of managing the job but not necessarily doing actual construction work. They are different from general and administrative (company overhead) expenses, which are costs incurred by operating the company itself.

NOTES

ESTABLISHING A CODING SYSTEM

An accounting and reporting system which assigns a specific code to each task on the project is the only reliable way to track job costs, especially the highly volatile cost of labor. Once established, the codes are used in all project reports so that everyone is using the same format and there is no room for misinterpretation.

There are two steps to establishing a coding system: doing a job breakdown and doing labor coding breakdowns.

Job Breakdown

The goal of a job contract breakdown (see Figure 16-1) is to identify the major activities involved in the project. It is accomplished by:

- Reviewing the scope of work and the plans and specifications to determine a logical construction sequence
- Doing a material and equipment take-off that establishes material and equipment needs for each step in the construction sequence, and
- Creating a manpower loading chart that establishes the labor requirements for each step in the construction sequence.

The result is an overview of the project that specifies the equipment, material and labor requirements of each stage of construction. See Chapter 23 for more information.

Labor Coding Breakdowns

A labor coding breakdown takes the construction stages identified in the job breakdown and reduces them to a sequence of tasks, each of which is:

- Clearly definable
- Capable of being reported separately
- Capable of being completed within a short time period (usually ten or fewer working days), and
- Broken down by trade, craft, system, and physical area of the job.

When this detailed breakdown is complete, each task is assigned a labor control code that conforms to the original job estimate and the general ledger of the company's accounting system. Because the company's existing accounting structure serves as a format for the coding system, there is no need for the project team to devise its own account codes.

In Figure 16-2, labor estimates and actuals are expressed in both man-hours and dollars. This type report should be used by the project team in assessing its performance in relation to its target gross profit but should probably not be circulated in the field. Some companies do distribute this report and make their field foreman responsible for controlling crew costs.

Material Control Sheets

The same coding system can be used for controlling materials as well as labor. This is particularly important on cost-plus (time and materials) jobs where every item used must be tracked.

A material control sheet similar to the labor report in can be designed using the dollar amounts from the estimate and the material and equipment takeoffs, and task codes similar to those in the labor coding breakdown. The resulting data should be integrated with the project's purchasing and field reporting systems, and the reports generated should include information on:

- Variances between quoted and actual prices
- Delivery status, and
- Invoice and payment status.

NOTES

TRACKING PROFITABILITY

The project team can track a job profitability by:

- Regularly comparing costs, especially costs of labor and materials, to estimates, and
- Revising cost estimates and contract amounts as changing job situations warrant.

Tracking Labor

Labor is the most volatile cost on any project and tracking it requires:

- An accurate and reliable reporting system based on the labor coding breakdown, and
- Project team commitment to the accuracy and timeliness of the reporting system.

The job supervisor plays an important role in this reporting system. It is his responsibility to:

- Submit weekly labor reports accurately listing the number of hours each mechanic worked on each task and the proper code number of each task, and
- Report percentages of completion for each task on the project, as part of his short interval planning duties.

As discussed in Chapter 15 of this manual, the project manager should require the job supervisor to record labor hours and codes on his report form daily to be certain he does not overlook any.

Fortunately, having the job broken down into small tasks makes it relatively easy for the job cost control to accurately report job progress. Because, it is easier to determine whether a ten-day task is 25 percent, 50 percent or 75 percent complete than it is to determine the same thing for an entire three-month stage of construction. It is also more accurate. Statistical theory (as well as practical experience) indicates that small errors in a large number of small categories tend to offset each other, providing a far more accurate overall result than the practice of basing estimates on a few large categories. Additional information on reporting percentages of completion is found in Chapter 9.

The Labor Report (see Figure 16-2) combines the data from the job supervisor's weekly labor reports (coded time tickets) and his estimates of task completion, adds them to previously recorded data, and compares the totals to the labor hours estimated for each task. The result summarizes two things:

- The status of labor usage on individual project tasks, and
- The status of labor usage on the project.

This labor summary provides everyone on the job with:

- Feedback on performance, and
- Information for planning further labor usage and modifying the labor strategy.

It also provides company executives with information for planning the financial strategy of the company.

Dealing with Variances

One of the most valuable aspects of a detailed labor reporting system is that it tells the project manager at a glance which tasks are under-, on-, and over- estimate, allowing the project team to make adjustments so that a gain on one task balances the loss on another. It is a system that is based on the identification and resolution of variances.

A variance is a difference between what is expected (estimated) and what actually occurs. There are two types of variances:

- Isolated variances, which are due to a single event or a temporary situation on the job and have a minimum effect on the job outcome, and

NOTES

- Variant trends, which are due to ongoing events or permanent situations on the job and can have a drastic effect on the job outcome.

Figure 16-3 illustrates the difference. The upper chart shows the outcome of an isolated variance—perhaps several days of bad weather or a missed equipment delivery date—which occurred when the job was 10 percent complete. Although the variance threw the budget off by 30 percent at this early stage (estimated cost: $10,000; actual cost: $13,000), the $3,000 discrepancy never grew beyond that. As a result, at the end of the job, it amounted to only 3 percent of the total contract amount.

The lower chart tells quite a different story. The variant trend began at the same point—when the project was 10 percent complete. But because it was part of a trend and not just an isolated incident—perhaps an unproductive work method or an estimate error that was left uncorrected—its effect persisted. At the end of the job, the discrepancy was 30 percent of the total contract amount.

Obviously, it is essential that the project manager learn to distinguish between isolated variances and variant trends and focus his primary attention on the latter. Regardless of whether a variance is isolated or part of a trend, he must take immediate action to correct it by:

- Redirecting efforts on the task affected by the variance, and
- Trimming costs on other project tasks to compensate for the loss of profits.

Revising the Job Estimate

As the job progresses, some tasks exceed their budget and others come in under it. Change orders add to and delete from the contract amount. The result is that the original estimate loses its meaning and its value as a score keeping tool.

The solution is to update the estimate continually so that it always reflects current and anticipated expenditures and changes to the contract amount. In this way, the estimate remains an accurate baseline for monitoring gross profit.

The procedure for revising the job estimate is simple:

- Modify the contract amount and the estimated direct job costs according to the latest data on contract changes and incurred and anticipated costs, and
- Recalculate the target gross margin by deducting all updated direct job costs from the updated contract amount.

Be sure everyone on the project team is informed about all changes to the target gross margin so that they can plan their strategies accordingly.

MONTHLY JOB STATUS REPORT

A Sample Monthly Job Status Report and instructions are shown in Figure 16-4. It portrays current trends in project profitability and forecasts the project outcome based on those trends, giving the project team essential information on all financial aspects of the project and the company management essential information on the project's contribution to overall company profitability. Notice that it includes:

- An accounting of all categories of direct job costs (equipment, subcontractors, materials, labor, and ODJC)
- A comparison of actual and estimated costs in each category
- A forecast of final costs in each category
- A calculation of the revised contract amount, and
- Statistics on gross margin and billing.

To be accurate, the Monthly Job Status Report must take into account all project costs, including paid invoices, committed costs, and anticipated costs. To be useful, its results should be

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communicated to all project personnel to give them feedback on job progress and a current basis for planning the remainder of the job.

BACK CHARGES

Avoid back charges by knowing what the contract documents say about them and making certain that your employees and your subcontractors perform within the letter of those documents. A useful way to avoid the cost and unpleasant surprise of back charges at the end of a project (especially likely if the general contractor has not made his expected profit on the job) is to amend the contract to require the project managers to agree at the end of each month on any back charges incurred during that month. Back charges not recorded or agreed upon on a monthly basis are therefore invalid. Make this change to the contract before signing it.

CONCLUSION

Earning a profit is the purpose of every project and the core job description of every project manager. It requires the same degree of skill and knowledge needed to master construction techniques. By building that skill and knowledge into an effective system, the project manager involves everyone on the project team in job cost control and produces profit day-by-day and task-by-task with a minimum of management effort.

DATE: 11/29/97 CONTRACT BREAKDOWN
JOB:
NAME:
CO#:

545	EQUIP RENTS	COST CENTER	DESCRIPTION	MAT'L	HOURS	LABOR $
545	PERMIT					
545	JOB PHONE	200	SLAB PIPE			
545	BOND	210	ABOVE PIPE			
545	UTILITY FEE	215	CABLE TRAY			
545	TOOLS	220	EXCAVATION			
545	PRINTING	230	BRANCH WIRE			
545	SUB-TOTAL	240	FEEDER WIRE			
		250	LV WIRE			
544	TRAVEL	260	MAIN DIST			
		270	BRANCH PANELS			
530	SUBCONTRACTS	280	MOTOR CONTROL			
		290	TRANSFORMERS			
900	OVER/UNDER	300	GENERATORS			
905	UNION GRANT	310	EQUIP CONN			
908	SMALL TOOLS	320	FIXTURES			
910	DISCOUNTS	330	DEVICES			
900	SUB-TOTAL	340	GROUNDING			
		350	SYSTEMS			
	BURDEN%	360	HEAT			
	TOOLS%	370	DEMOLITION			
	EXPENDABLES%	375	LINE WORK			
	OVERHEAD%	380	EXTRA WORK #1			
	MATERIAL TAX %	390	EXTRA WORK #2			
	AVERAGE RATE	400	EXTRA WORK #3			
	CONTRACT AMT	410	EXTRA WORK #4			
		420	TEMP POWER			
	CONTRACT RECAP	430	PROJ CO-ORD			
			TOTALS			
	TOTAL HOURS %/Prime					
	LABOR DOLLARS		NOTES:			
	MATERIAL					
	SUBCONTRACTS					
	OTHER P/R (544)					
	ACCTS PAY (545)					
	ADJUSTS(900)					
	BARE COST					
	LABOR BURDEN					
	TOOLS					
	EXPENDABLES					
	MATERIAL TAX					
	PRIME COST					
	OVERHEAD					
	PROFIT					
	CONTRACT TOTAL					

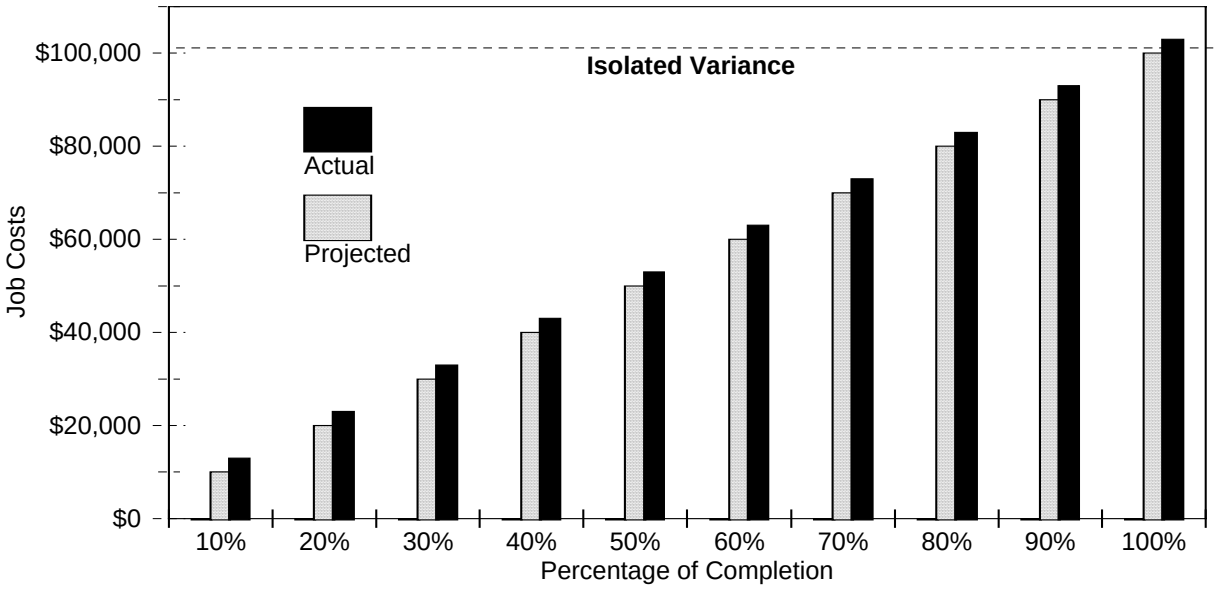
Figure 16-1 Sample Contract Breakdown

LABOR REPORT (Man-hours and Dollars)										
Job Name										
Work Code	Description	Bid Estimated Labor		Change Orders Thru No. 3 Amount	Est. Total Amount	Est. % Complete	Budgeted Amount Complete	Actual Labor To Date		Gain or (Loss) To Date
		Man-hours	Amt					Man-hours	Amt	
TOTALS										

Figure 16-2 Labor Report (Man-hours and Dollars)

Managing by Exception

Results of Isolated Variance and Variant Trend



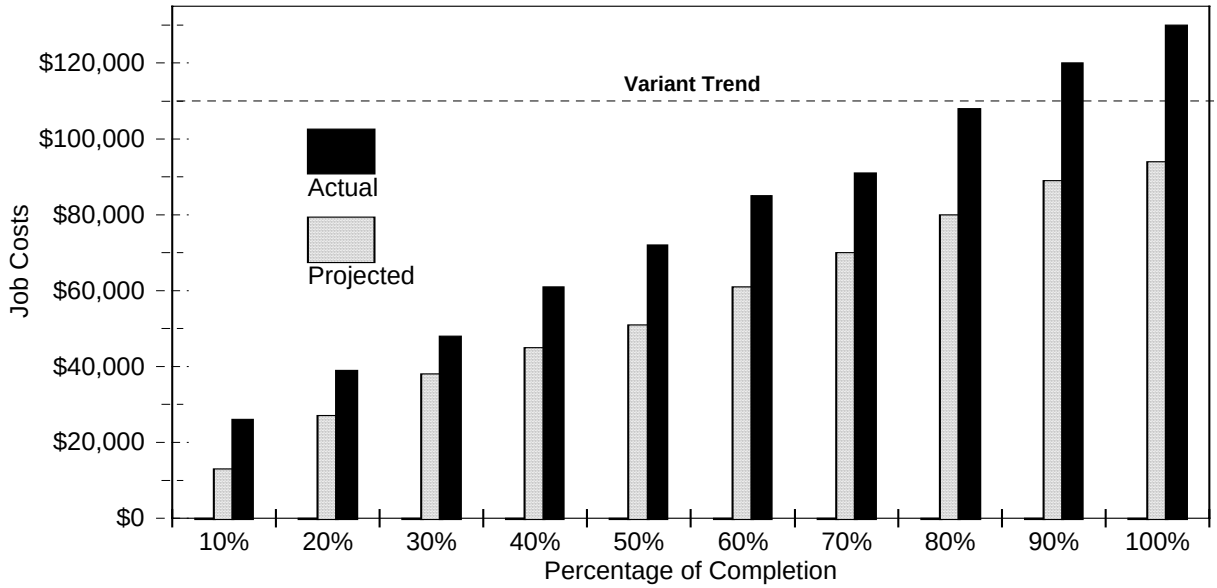


Figure 16-3 Results of Isolated Variance and Variant Trend

MONTHLY JOB STATUS REPORT

JOB NAME:	JOB NO.	PERIOD ENDING

Item	Costs to Date	Original Cost Estimate (Incl. C.O.'s)	Present Forecast of Final Costs
Equipment			
Subcontract			
Materials			
Labor			
Other Direct Job Costs			
TOTALS	$	$	$
Amount Invoiced		*	

CONTRACT VALUE

Original Amount		$
Authorized Change Orders		
Estimated Value—C.O.'s In Process		
Extras for Principal Customer		
Extras for Others		
	Revised Contract Value	$
	Gross Amount Invoiced	$

OTHER STATISTICS

Current Mark-up % On Cost	%
Earned Gross Margin to Date	$
Earned Gross Margin—Prior Period	$
Earned Gross Margin—Current Period	$
Unabsorbed Gross Margin	$
Amount Overbilled	$

* Gross	
10% Retainage	
Net	

Figure 16-4 Sample Monthly Job Status Report and Instructions (Sheet 1 of 2)

INSTRUCTION SHEET

Monthly Job Status Report

Top Portion—All Project Direct Costs

1. First Column ("Item")—List five direct cost categories: equipment, subcontracts, materials, labor, other direct costs.
2. Second Column ("Costs to Date")—Enter the costs to date in each category. Costs are based on paid invoices, payroll, shop material, tickets, etc.
3. Third Column ("Original Cost Estimate")—Enter estimated costs in each category. All change orders to date should be included here.
4. Fourth Column ("Present Forecast")—Forecast of final costs. To forecast final cost in each of the direct cost categories:
   a) Equipment—Total the amounts of committed purchase orders to date. Add to that the total budgeted for equipment that has not been given purchase orders yet.
   b) Subcontracts—Same as equipment. Add up the committed purchase orders and add whatever amount of the subcontract budget is still uncommitted.
   c) Materials—Consider the original cost estimate, as revised by changes that have occurred on the job. Adjust the revised estimate with any savings or overruns experienced to date.
   d) Labor—Add up the numbers in the projections column of the monthly Labor Report.
   e) Other Direct Job Costs—Add up all the miscellaneous costs posted to date (rentals, trailers, telephone bills, etc.) and add to that the best projection of what future costs are expected.

Bottom Portion—Contract Value and Other Statistics

<u>Contract Value</u>

1. Upper left corner—Space provided to fill in net amount invoiced on the job. Net amount invoiced is the gross amount billed to customer minus retainage.
2. Contract Value—List original selling price of contract, the dollar amount of all authorized charge orders and the estimated value of any charge orders in progress. If there are any extras that have been included for either the principal customer or anyone else on the project, they're also listed. The total of these is the Revised Contract Value.
3. Gross Amount Invoiced—Listed below Revised Contract Value.

<u>Other Statistics</u>

1. Current Mark-up Percentage—Projection of the percentage of gross margin that is expected, based on the revised contract amount and forecast of final costs.
2. Formula: Current mark-up on costs—From revised contract value, subtract forecast of final costs. Then divide the difference by the same cost forecast.

   Example—To Calculate Current Mark-up %

Revised Contract Value	140,000
Cost Forecast	(125,000)
Dollar Value of Current Mark-up	15,000
Present Forecast of Final Cost	÷125,000
Current Mark-up % on Cost	12%

3. Earned Gross Margin—Amount of gross profit earned through completed work.
4. Unabsorbed Gross Margin—Amount of gross profit that is expected from the project but has not yet been earned.
5. Amount Over-billed—Gross Amount Invoiced minus the project costs to date plus the current mark-up on costs.

Figure 16-4 Sample Monthly Job Status Report and Instructions (Sheet 2 of 2)

NOTES

THE FACTS ABOUT JOB SITE SAFETY

Safety is a responsibility that can be shared but never completely delegated, a responsibility for the lives and well-being of the workers themselves. Safety affects the bottom line—accidents can be expensive. They can incapacitate skilled workers, disrupt construction activities, raise your company's insurance and workman's compensation rates, and place your company in legal jeopardy. On the other hand, a good safety record and safe working conditions boost employee morale and therefore contribute to increased productivity and profit.

Construction contractor safety records are now becoming a basic part of owner evaluation of a contractor when putting together bid lists. Poor safety performance can result in your company being eliminated from bid lists.

Safety is also the law. National and state governments have passed a large body of legislation related to safety and have established agencies to enforce it, most prominently the Occupational Safety and Health Administration (OSHA).

Finally, good safety records don't just happen. They are earned. The saying, "A company does well only those things that the boss checks," is especially true here. Making safety a priority on the job and treating it like other job priorities is the only way to ensure a safety program that really cares about workers and produces an excellent job safety record.

ELEMENTS OF AN EFFECTIVE SAFETY POLICY

Company Policies

An effective project safety program begins with a written company safety program, strongly supported by management, that provides:

- A corporate commitment to safety
- Line management responsibility for execution of the safety programs
- Safety measures for all projects
- Safety measures pertinent to each individual project
- Compliance with all pertinent sections of the Occupational Safety and Health Administration (OSHA) Act
- The owner or general contractor's safety requirements, and
- Enforcement of procedures for non-compliance with company rules by employees/

A company should base its safety program not on one source of safety information but on a variety of sources, including:

- Current state and federal laws
- Company records and experience
- Industry safety materials such as those available from SMACNA, NECA, and MCAA, and
- Cost containment programs offered by the company's insurance carrier.

Where possible, one individual in the company should be appointed Safety Director and charged with the responsibility of staying informed on new safety developments and laws, reviewing company policies, recommending changes, keeping safety statistics, filing all required reports, and monitoring the company's Experience Modification Rating (EMR). A poor EMR for your company will significantly increase your insurance premiums, thus decreasing your profit. Enforcing company safety policies on the job site should be the responsibility of the line management (project manager, superintendent, and foreman).

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OSHA Requirements

Everyone on the project team should be thoroughly familiar with OSHA regulations and follow them carefully. This includes both administrative regulations related to such things as posters, reporting procedures, job site inspection procedures, and construction regulations as they relate to employee training and job site compliance.

Project Requirements

Projects with unusual safety problems should have a written safety policy that addresses these safety situations. The policy should be prepared by the project team based on the company's normal safety program. It should also include pertinent parts of the safety program established by the project owner and the general contractor.

To develop an inclusive safety policy, the project team must obtain copies of the owner's and general contractor's safety policies and review them carefully to identify:

- Points to be included in the specialty contractor's policies, and
- Areas where safety policies are unclear or inadequate.

This review should be followed by a meeting with the owner's and general contractor's safety representative to discuss:

- Introduction of the project authority's safety representative to the member of the project team
- Overall safety strategies
- Specific safety requirements and procedures related to the job
- Necessary safety procedures that are inadequate or unclear in the existing policies
- Specific safety responsibilities of both parties
- Scheduling of regular safety inspections and meetings to discuss safety topics, and
- Procedures for identifying, reporting, and correcting hazardous job situations in a timely fashion.

Site Inspections

Before work begins, the project team should conduct a safety inspection of the job site. The inspection team should be headed by the project manager and include at least the field supervisor, the job foreman, and the company safety officer. The inspection should focus on existing and potential safety problems and be followed by two meetings:

- A meeting of the project team to discuss the safety situation and develop proposals for correcting existing problems and avoiding potential problems, and
- A meeting with the owner, the general contractor, and their safety representatives to discuss and implement policies that satisfactorily answer the project team's concerns.

Once work begins, inspections should be conducted regularly. In connection with regular inspections, the project manager should:

- Assign responsibility for these inspections to a specific member of the team
- Provide that person with job site safety inspection checklists to use in every inspection
- Insist that the results of every safety inspection be distributed to the appropriate members of the project team, and
- Stipulate that, whenever results warrant it, an inspection should be followed by a meeting with the appropriate project authority to discuss and correct hazardous situations.

In addition to regular inspections, the project manager should conduct his own special inspection whenever notified of hazardous conditions at the job site. Following such inspections, he should meet personally with the general contractor and the owner's safety representatives to resolve the problem.

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The Safety Director and Project Management Responsibilities

Some companies have a designated safety director whose responsibilities should be to develop and maintain adequate safety policies, procedures, and systems. Project managers, assisted by a safety director, should be responsible for safety on each individual project. The duties of the project manager, assisted by the safety director, superintendent, and foreman are:

- Supervise project housekeeping
- Provide and maintain safety-related equipment such as: first aid kits, hard hats, gloves, goggles, welders' helmets, respirators, and other personal protection equipment
- Regularly inspect tools and construction equipment, including extension cords, and tag worn or damaged items for return to the company shop for repair or replacement
- Regularly inspect personnel and material handling equipment and facilities, particularly hoists and rigging, scaffolding and man lifts, storage areas, and traffic paths
- Enforce and verify lock-out/tag-out procedures
- Regularly check the condition of special items such as fire extinguishers and acetylene and oxygen cylinders, valves, hoses, and other accessories
- Ensure that mechanics know how to use the tools needed for the job, instructing new mechanics in the proper use of basic tools and all mechanics in the proper use of specialized tools
- Monitor the use of all tools, construction equipment, and job site facilities
- Enforce safety procedures for special conditions such as working inside tanks, enclosures, and other confined spaces
- Monitor compliance of company personnel and subcontractors with all company and project-specific safety policies
- Correct all safety violations and hazardous conditions that are the responsibility of the specialty contractor
- Report to the project manager or other project authority all unsafe practices by other trades and hazardous conditions that are the responsibility of the general contractor or the owner to correct
- Educate field personnel in safety matters, making sure that every employee receives a copy of, and clearly understands, all company, owner/general contractor, and OSHA safety regulations
- Post safety information, as required, including OSHA notices, emergency telephone numbers, hand signals for directing cranes, special project safety notices, and the address and telephone number of the company office where OSHA-required illness and accident reports are stored, and
- Conduct regular safety meetings to cite safety procedures not being followed in the field, introduce new safety policies, and review procedures for handling emergency situations.

As this lengthy list of responsibilities attests, the line management's job is not a small one. It involves a high level of organization, knowledge, and commitment and requires the support of the project team and the company's top managers. Without this support, the entire safety program becomes little more than an exercise in paperwork.

Procedures for Handling Accidents

Be certain that everyone on the project team knows what to do in case of an emergency. Encourage everyone on the project team to receive first aid training. Review procedures often at safety meetings, so that reacting properly to a medical emergency becomes a practiced reflex.

Among the points to cover are procedures for:

- Exiting the building of facility in the event of an emergency.
- Giving the injured person(s) immediate and proper first aid
- Contacting emergency medical services, the rescue squad, or a qualified physician
- Notifying the company office, and
- Identifying any missing personnel

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Job supervisors and foremen should also know what to do following an accident, including:

- How to investigate all details of the accident
- How to file a complete report, and
- How to correct any unsafe conditions that may have contributed to the accident.

Finally, the project manager should know the proper procedures for notifying OSHA, the company's insurance carrier, and any other parties who require notification of job site accidents.

Procedures for Handling an OSHA Inspection

An OSHA inspection always raises concern. Not that project managers run sloppy jobs, but OSHA regulations are so extensive and complex that it is sometimes difficult to be sure you are in compliance with all of them. The best a project team can do is to enforce safety regulations and respond quickly to correct any deficiencies indicated in an OSHA inspection report.

When an OSHA inspector comes onto the job site, these procedures should be followed:

- The field supervisor or foreman should notify the project manager and the company's safety director immediately
- The project manager and safety director should go to the job site to meet and accompany the OSHA representative during his inspection. If this is not possible, then the field supervisor or job foreman should act as the company's designated representative.
- The project manager, safety director, or other designated company representative should meet with the OSHA Compliance Safety and Health Officer (CSHO) during the opening inspection conference to
  - Verify the officer's credentials, and
  - Determine out the purpose of the inspection
- The project manager, safety director, or other designated company representative should accompany the CSHO during the inspection of the contractor's portions of the project
- The project manager, safety director, or other designated company representative should attend the CSHO's exit conference
- All inspection results should be reported immediately to the project manager, the company safety director, and all other appropriate company authority
- The project manager and the safety director should take all steps to correct all deficiencies cited in the inspection report as soon as possible, and
- When all deficiencies are corrected, the project manager or safety director should notify OSHA and the company's insurance carrier.

SAFETY BENEFITS VS. COSTS

A good safety program can usually be put into effect at very minimal costs. Direct costs will include some project managers time and printed material. Many programs include discussions with field labor by the project manager, distribution of bulletins, and tailgate meetings at the site. A poor safety program, or no program at all, results in poor safety records. The costs of poor safety records far exceeds the cost of a good safety program. Some of the larger cost items are significant increases in insurance costs, reductions in labor productivity, and lost opportunities to bid on projects where safety is used as an evaluation criteria by owners and general contractors. The primary reason, however, for good safety is to prevent injury or death. A fringe benefit to the contractor is reduced cost. See Figure 17-1 for a sample "Contractor Cost Calculation Worksheet."

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CONCLUSION

There is no excuse for a poor safety record. The company and the project team have a legal and moral responsibility for the safety of the people they employ. This responsibility extends not only to monitoring and correcting situations that they control directly but also to those situations under the control of the project authorities and the other trades on the job. Developing company and project safety programs that foster “safety consciousness” in everyone on the team goes a long way toward meeting these responsibilities.

CONTRACTOR COST CALCULATION WORKSHEET		
Your Company Information		
Company Size (Employees) =		
Annual Direct Payroll =		
Gross Profit and Overhead =		
Direct Wage per Hour =		
Hours Worked per Employee =		
Average Manual Rate =		
Recordables per Year =		
Lost Workday Cases per Year =		
Indirect Cost per Recordable =		
Indirect Cost per LW Case =		
Current Experience Modifier (EMR)		
New EMR Goal after 4 Years =		
Your Calculation		
Direct Wages = Emp x Hrs x Wage Direct Wages =		
Base Premium = Direct Wages x Average Manual Rate % = Base Premium =		
Modified Premium = Premium x Current EMR = Modified Premium =		
Indirect Costs = [(Rec – LWC) x $1,100*] + [LWC x $21,000] = Indirect Costs =		
A) Total Cost = Modified Premium + Indirect Costs		
By eliminating injury, you can lower the EMR to “Goal” and eliminate most indirect cost.		
B) New Costs = Base Premium x New EMR =		
Plus smaller indirect costs =		
Savings = Total Costs (A)	(A)	
- New Costs (B)	(B)	
Savings =		
New Profit Level = Old Profit		
+ Savings =		
New Profit Level =		
		(or %)

* Use these or your own estimates.

Figure 17-1 Contractor Cost Calculation Worksheet

CHAPTER 18 CUSTOMER RELATIONS

NOTES

THE CUSTOMER AS EMPLOYER

Your customers—project owners, general contractors, and design professionals—are your company's employers. They define the work to be done and pay your company to complete it. They gauge your performance on every project and use their assessments to decide whether to employ you on the next job. To keep getting work and getting paid, your company must constantly prove itself, and must steadily strengthen its relationships with its customers. This is the role of customer relations.

Customer relations has another role, as well. It helps every project go smoother, because it establishes relationships that make discussion, negotiation, cooperation, and compromise possible.

As project manager, you are the point man for your company. You are your company's chief representative on the job. All information and instructions cross your desk. You make decisions, and attend meetings. If you do your job well, your company is viewed as doing well. If you establish good working relationships with the customer and the other trades, your entire company enjoys the benefits of relationships.

AN ORGANIZED APPROACH

Customer relations is an important part of your job and you should approach it with the same sense of organization that you exercise in other aspects of your work.

Identify Important Project Relationships

The first step is to identify your customers. Depending on the type and complexity of the project, your customer might be the project owner, the design professional or the general contractor or construction manager.

Establish Procedures

Establish specific lines of communication and responsibility with each customer. Make sure everyone on the project team knows what his role in customer relations is by:

- Distributing a job organizational chart that shows the project chain of command and channels of communication with each customer
- Distributing a complete list of your customer's representatives on the project with their business addresses and telephone numbers so that everyone knows how to get in touch with them when necessary (see Figure 7-3), and
- Establishing and enforcing policies for accepting verbal orders from the customer and settling conflicts with the customer.

Assign Responsibilities

Assign responsibilities for customer relations to individuals on the project team. In particular, make sure everyone who will have regular contact with the customer or his representatives (your job supervisor, foremen, safety director, etc.) understands his duties and limitations regarding communications with the customer.

Emphasize to everyone that:

- The customer is your company's employer and deserves its best product
- Only by consistently giving customers your best can you win repeat business
- The owner's architect or engineer is the project designer and deserves full support in coordinating and building the project
- The subcontractor is a part of the general contractor's or construction manager's support team, and

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- The contract identifies the job's overall coordinator and the subcontractor's legal contact for the project. Only that contact, or the person he designates, is authorized to issue instructions or approve or disapprove changes in the project.

Hold Regular Meetings

Hold regular meetings with your customer in order to:

- Discuss project progress
- Keep him informed of upcoming mechanical activities
- Mutually resolve problems related to mechanical activities, such as scheduling, access to facilities, and coordination with other trades, and
- Air grievances before they become items of contention.

The Role of Entertainment

Providing entertainment is a useful and acceptable means of developing rapport with customers and key business associates. However, it is no substitute for professionalism, good preparation, and effective business communications.

Low-key entertainment, such as lunches and sporting events, help to establish effective communication and soothe adversarial relationships. Providing very expensive or lavish entertainment, however, must be approached with extreme caution. A customer or business associate may regard it as an attempt to "buy" goodwill or special advantage or as a substitute for abiding by the contract documents. Many companies have strict policies forbidding their employees from accepting any kind of gift or entertainment; being insensitive to such policies can be extremely damaging to good relations.

RULES FOR COMMUNICATION

To establish and maintain smooth customer relations on a project, you should:

- Know your authorized contact on the project
- Make it a rule to accept instructions from that contact only, and
- Talk with your contact daily to ensure a steady two-way flow of information regarding work areas, time schedules, storage, and other matters, and to keep daily problems from turning into long-term crises.

In addition, you should insist that all directions and communications you give to or receive from your authorized contact be specific and in writing.

CONCLUSION

All businesses are built on relationships. If your company's relationship with its customers is good, its business will likely be good. A customer who is satisfied with the products you provide and the way he has been treated is likely to give your company repeat business and recommendations to new clients. If the relationship between the company and the customer sours, however, not only is repeat business eliminated, but word of the poor relationship will spread to potential customers, making it more difficult for your company to get new work.

CHAPTER 19 COMMUNICATION

NOTES

WHY COMMUNICATION IS IMPORTANT

Communication can seem like an over-used topic in the business world. Many books and training programs on both the value and "how to" of effective communication in the workplace exist. Yet, despite this abundance of material, most organizations need to do a better job to compete in today's marketplace. In the construction industry, effective communication between managers, supervisors, workers, and the various trades on the job site can literally make or break the profitability and productivity of a project.

Part of the problem lies in the nature of the construction business itself. Everyone is in a hurry and juggling half a dozen jobs at once. No one stands in one place for very long. You can't seem to get more than 10 percent of the management team in the same room at the same time. Yet, all industries are dependent on up communications.

As a project manager, effective communication is a skill that you must use everyday. Consequently, this gives you an opportunity to continually improve the communication process on your jobs. This chapter contains valuable information that should be periodically reviewed to see where you can implement improvements that can ultimately increase the productivity of the projects you manage.

A MATTER OF PRIORITIES

Another part of the problem is that communications isn't very high on anyone's list of priorities. For example, consider this rather typical list of Things to Do Today:

- Convince the general contractor to let your foreman use the crane to set the equipment before the concrete contractor pours the overhead deck
- Track down a 40-foot trailer full of pipe that's lost somewhere between here and Anchorage, Alaska
- Work out your differences with the construction manager on the other job so that you don't have to go to court over $15,000 of back charges, and
- Communicate effectively with everyone.

Is there any question which of the four is almost everyone's last priority? Yet if you look at the first three items on the list, you notice something interesting. Every one of them involves communications. In fact, it's difficult to think of a single job activity—from planning, scheduling, and reading drawings to negotiating change orders, holding safety meetings, arranging for system tests, and completing punch lists—that isn't, at its core, a communications activity.

Seen from this point of view, it begins to look as though trying to manage a construction project without knowing how to communicate effectively is a little like trying to play basketball without knowing how to dribble. Your lay-up may be a thing of beauty, but you have no way to get the ball down court for a shot.

A WORKING DEFINITION

Communication is a collection of tools to help you understand and be understood. Some are best for listening, others for speaking and writing. The most important communication tool is the ability to focus all your attention on what you're hearing as well as what you're saying, to recognize when someone doesn't understand what you are trying to say, and to admit when you don't understand what someone else is trying to tell you. Some communication tools are most effective face-to-face. Others are best for memos, letters, and telephone conversations. As in any craft, mastery lies in using the right tool at the right time.

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EVERYDAY TOOLS FOR COMMUNICATION

There are two basic categories of communications tools: formal and informal. Formal tools are such things as:

- Meetings
- Letters
- Memos
- E-mail
- FAX
- Project contract
- Change order approvals
- Organizational chart
- Job reports and records
- Crane operation signals
- Posted signs
- Submittal data
- Project drawings and specifications
- Written job procedures
- Company policies, and
- This manual.

Informal tools for communications include:

- Conversations
- Asking questions
- Telephone calls
- Notes
- Facial expressions, and
- Body language (gestures, signals, poses, etc.).

Communicating effectively requires you to select the right tool for each communications task—formal or informal, written, verbal, or gestural. Sometimes selecting the right tool depends on the situation. Negotiating a change order with the project engineer, for example, demands an approach different from discussing football with him over coffee. Explaining a new system for packaging prefabricated work might take a full morning while getting the crane to raise a bundle of prefabricated components to the roof requires only a few hand signals.

At the same time, the personalities of the people involved in the communications process influence which tools to use. Some people demand full explanations of why you're asking them to do something before they'll do it. Others just want the bottom line—what do you want and when. Some people forget everything you tell them unless you put it in writing. Others don't have time for notes and memos; just mentioning something to them is sufficient.

The trick is to know each situation and person well enough to figure out which communications tools will get your point across.

VERIFYING COMMUNICATION

One of the most forgotten facts about communication is that the communication process is a cycle. It starts with someone having a message he wants to communicate to someone else. He analyzes which approach is best for the type of message, the situation, and the person he's trying to communicate with, then he follows that approach in communicating his idea. For a lot of managers, this is where the process ends and is a major reason why project communications are often so poor.

Telling someone your idea is only half of the cycle. The other half is verifying that he received your message and understood it. This is the feedback part of the cycle. It lets you know if the other person really understood what was just communicated. In many cases, you'll know just by

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looking at someone's body language—the way he's standing, or the look on his face—whether or not you are communicating your point effectively.

Relying on body language for feedback might be fine for informal communications where the message isn't too important but when the information you're trying to communicate is really vital—instructions about a change in the drawings, a new policy issued by the general contractor, a warning about a safety violation—you have to make sure your message has gotten across. The best way to do this is to ask straight-out, "Do you understand what I just said?" or "Okay, now what have we decided here?" Your only other option is to assume that the person understands what you told or asked him, and then wait to see if he acts on your message in the way you expect. Unfortunately, by relying on this latter alternative, you often learn too late that you weren't understood at all. That could cost the project money.

THE COMMUNICATIONS NETWORK

Know who you have to communicate with on a project and make a point of learning how to communicate well with each person. Don't wait until you have a critical message to get across before having your first conversation with the people in charge. Have an informal meeting or two with every principal on the project—from the project owner to your company's chief accountant—before work begins. Get an idea of how to communicate with each one of them, how each one likes information served to him, which communications approaches work with him, and which ones don't. Information like this will prove invaluable later on.

On your list of people to learn to communicate effectively with, be sure to include:

- Project owner
- Project architect or engineer
- Construction manager or general contractor
- Project manager for each of the other trades
- Each subcontractor
- Each major supplier
- Your boss
- Each member of your project team (field foreman, shop foreman, superintendent, accountant, secretary, estimator, purchasing agent, etc.)
- Local inspection authorities
- Representatives of government agencies, and
- Your company's insurance agent

It may seem a wasted effort to learn how to communicate with everyone on this list. After all, how often do you deal with your company's insurance agent? When you have a big insurance claim to file, though, you're going to be a lot more comfortable talking with that agent if you know him a little than if he were a complete stranger.

Ensure that everyone else on the project team is communicating with one another. Do everything you can to stimulate communication between the job site and the office, the office and the shop, and the shop and the field. If you sense a problem—perhaps caused by personality conflicts or differing points of view—resolve it immediately. Communications problems never resolve themselves on their own. Instead, they grow and fester, hindering project operations and dampening the morale of everyone on the project team.

MAKE A STUDY OF COMMUNICATION

When you're talking or listening to someone, pay attention to the situation. Know what's going on. Make mental notes of which phrases and gestures really communicate, and which do not. Study how people you admire or respect communicate with you and with others. Start a file of effective model letters and memos. Insert some of them into this manual at the end of this section and use them as a guide when writing your own documents.

CONCLUSION

Communication isn't just a buzzword. It is an essential part of everything that happens on the project and. is the basic skill on which all other skills rely. It is not possible to cover the topic of communication in detail due to the extensive impact of communication on the project. There are, however, many sources available that you might find helpful. Contact your Alliance trade association for additional references.

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CHAPTER 20 CONFERENCES AND MEETINGS

NOTES

DEFINITION AND PURPOSE

Job conferences are meetings called by the project owner or the general contractor to discuss specific job phases or situations. They are attended by representatives of all the trades on the project and focus on topics of mutual concern. Job conferences should be held regularly, usually weekly. Special job conferences should be called any time a project situation warrants it.

Job meetings are smaller-scaled conferences that are called or requested by the contractor in order to discuss particular aspects of the job with the project owner, the design professional, the general contractor, subcontractors, or the contractor's in-house staff. They are essentially private discussions. Some focus on overall job progress, others on specific situations or problems.

Memos and letters are no substitute for job conferences and meetings, which allow face-to-face discussion, problem solving and negotiation, and maintain vital channels of personal communication. Therefore, while a steady flow of written information is important, the project manager should never allow it to become a substitute for meeting with the other parties on the project. He should make a point to attend all job conferences and carefully prepare for each one. He should also feel free to call a job meeting with a particular party when necessary.

CONSTRUCTION CONFERENCES

Construction conferences are meetings called by the project owner or the general contractor to discuss aspects or phases of work of interest to all trades on the job. Some, like prebid, preconstruction, and regular job conferences, are standard practice on almost all projects. Others are called to discuss items or resolve problems such as:

- Substitution of materials or products
- Change orders and extra work
- Unforeseen underground work
- Corrective work
- Scheduling changes
- Mediation of construction difficulties
- Protests and disputes
- Conflicts in plans and specifications
- Value engineering proposals
- Safety hazards
- Punch lists, and
- Project acceptance and transfer of responsibility.

The single most important conference on any project is the preconstruction conference.

Preconstruction Conference

The preconstruction conference is a general meeting of all the major parties on the project. It is held after the major subcontracts have been awarded and prior to beginning of actual construction. The participants are:

- Project owner
- Architect/engineer
- General and prime contractors
- Subcontractors and their superintendents
- Key suppliers, and
- Public agency representatives, as necessary.

The purpose of the conference is to establish acceptable ground rules for all parties on the project so that everyone knows ahead of time what is expected of him and how situations that

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arise will be handled. It is an effort that may require several hours or several days, depending on the size and complexity of the project.

A typical agenda for a preconstruction conference includes the following items:

- How progress payments will be made
- Format of payment requests
- Payroll reports (Davis-Bacon Act provisions)
- Shop drawing and submittal data requirements
- Required insurance and permits
- Project schedule
- Temporary facilities
- Temporary utilities
- Storage facilities
- Clean up and trash removal
- Material handling equipment and facilities
- Change order procedures
- Employment practices
- Listing and identification of subcontractors
- Punch list procedures
- As-built drawings
- Final payment and retainage, and
- Scheduling of regular job conferences.

For the preconstruction conference and all other conferences held during the course of the job, the project manager is responsible for:

- Discussion of his company's requirements and opinions regarding everything on the agenda, and
- Conducting himself in a way that enhances his image, and that of his company, and earns his project team advantages in the project effort.

Preparation

Prior to each job conference, the project team should meet to identify any points it wants included on the agenda and to establish its positions on those items and any others expected to be discussed. For most conferences this team meeting can be part of a regular short interval planning meeting. Following the team meeting, the project manager should inform the project owner or the general contractor of the points he wants included on the conference agenda.

For special conferences—those called to discuss particular problems or situations—the project team should hold a special preparatory meeting to:

- Review the conference agenda
- Determine who requested the conference and why
- Discuss the politics behind the conference
- Research the background of the subject to be discussed
- Establish company objectives for the conference, and
- Design a strategy for reaching those objectives.

It cannot be stressed enough how important it is for the project manager to be fully informed about his company's positions on specific items and be able to report accurately on the progress of the mechanical work. His command of the facts demonstrates his professionalism and helps him assert leadership at each conference.

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Projecting an Image

The way the project manager conducts himself at a job conference can have a tremendous impact on the way he is perceived by everyone else on the project. He should always strive to project an image of authority and confidence—an image of leadership.

Among the ways to establish and maintain that image are:

- Dress conservatively
- Maintain an appearance of authority
- Be certain of your facts and confident in expressing your opinions
- Avoid being overbearing, and
- Avoid begging or patronizing.

The seat you choose at a conference is also important. Arrive at each conference early enough to choose the seat you want, and:

- Sit either at the opposite end of the table from the conference leader or next to him, and
- Avoid sitting where your eye contact with the conference leader is obstructed.

There are dozens of books and other materials available that teach how to enhance your business image. Use some of them to help you sharpen your meeting skills and give yourself an advantage at job conferences. Contact your Alliance trade association for a list of these references.

JOB MEETINGS

The project manager should hold regular meetings with the customer, the subcontractors, and the in-house staff throughout the course of the project and should call special meetings whenever necessary to deal with a job situation.

Meetings with the Customer

The project manager should meet privately with the project owner or the general contractor at least once a month to give both parties an opportunity to discuss in detail the project's mechanical activities. He should inform the customer ahead of time of items he wants to discuss and invite the customer to discuss points of special concern or interest to him.

The project manager should prepare for each meeting by holding a short interval planning meeting. In this way, he will have the latest information on job progress and situations and be able to canvass the project team for their suggestions and recommendations. He should give special attention to compiling all the information he needs to support points he wishes to discuss and to answer points the customer is expected to raise.

For the meeting, he should arrange a means for recording accurate minutes of the meeting. Using a tape recorder or having a project team member or an administrative assistant there to take notes are both good choices. The minutes should be typed up in final form immediately after the meeting and a copy sent to all parties who attended and any other party with a special interest in the points discussed at the meeting.

Meetings with Subcontractors

The project manager should hold a private meeting with each subcontractor at least once a month and should call special meetings whenever necessary. He should set the agenda ahead of time so that the subcontractor can come to the meeting fully prepared. The agenda should allow for limited discussion of points not identified beforehand.

For special meetings, the party requesting the meeting should inform the other of the purpose of the meeting. If the agenda includes items which require the attendance of other subcontractors or trades, these parties also should be informed of the agenda in time to prepare.

Here again, the project manager should arrange to have minutes of each meeting recorded and distributed.

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Meetings with In-House Staff

Regular in-house staff meetings are one of the most ignored tools in project management. Even project managers who are meticulous about maintaining communications with every other trade on the job often overlook the importance of keeping his own company informed.

In-house staff meetings are different from project team meetings and short interval planning meetings. They are meetings that bring together all company personnel to discuss the project and the company's operations in general. In most companies, they are the only opportunity for office and field personnel to have face-to-face discussions.

Regular staff meetings should be held at least monthly. Special meetings should be called by the project manager or a company officer whenever necessary.

As with all of the other conferences and meetings discussed in this section, each in-house staff meeting should have a set agenda that is distributed before the meeting. It should include not only points that management wishes to discuss, but items requested by the general staff. It should also allow time for limited discussion of points not included in the agenda.

Preparation on the part of the project manager and the company's managers is especially important in order to demonstrate the project's and the company's sense of organization and direction. Someone should be assigned to record the minutes of each meeting.

MID-POINT REVIEW

The mid-point review is a special in-house meeting held at the halfway point in the project schedule. Essentially it is a pre-planning meeting for the second half of the project; therefore everyone who attended the pre-planning meeting at the beginning of the job should attend the mid-point review.

Preparation

The project manager should issue an agenda for the meeting, including:

- The date, time, and location of the meeting, and
- An outline of all topics to be discussed.

He should also tell each project team member what to bring to the meeting, including:

- Information on current job status
- Specific recommendations for completion of the project, and
- Additional information related to individual project responsibilities.

For his own part, the project manager should conduct a site inspection just prior to the meeting, using the Site Visit Report form found in the "Turnover Meeting" section of this manual. This inspection gives him current firsthand knowledge of job site conditions and situations.

Conducting the Meeting

As a meeting guide, the Pre-planning Meeting Checklist (see Figure 7-2) in this manual is ideal. Although it may require some modification for the midpoint review, it includes most of the topics that should be discussed.

High on the list of the meeting's priorities should be the review of all project schedules, including:

- General contractor's schedule
- (MEP) Activities schedule
- Subcontractors' schedule, and
- Prefabrication and drawing schedule.

The project's current financial status is another major topic, and a current Monthly Job Status Report and the latest Labor Report (see Chapter 16) should be available. It is particularly important to review:

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- Variances in labor estimates
- Material and equipment usage
- Impact of change orders
- Billing status, and
- Projected job outcome.

During the meeting, review existing or anticipated job situations that might influence mechanical activities, particularly:

- Changes in organizational structure
- Chronic delay situations
- Changes to scope of work
- Changes in material handling facilities
- Conflicts with other trades and personnel outside the company, and
- Claims.

Based on your review, revise the job strategy as necessary by:

- Rescheduling activities, and
- Modifying project procedures.

Leave ample time for open discussion of job situations, but avoid letting the meeting degenerate into a scapegoating or finger-pointing session. Emphasize the need for constructive comments and recommendations.

As with all meetings, the project manager should assign someone to take detailed minutes of the meeting and distribute copies of those minutes as soon as possible.

GENERAL GUIDELINES FOR CONDUCTING MEETINGS

Some general guidelines for conducting meetings are:

- Always use an agenda and follow it (New subjects brought up should go under new issues at the end of planned items)
- Start on time
- Listen to team members
- Do not conduct one-on-one discussions in meetings
- Keep meetings short (one hour or less, if possible)
- Complete meetings on time
- Do not dictate (lead and motivate)
- Use participative methods
- Develop and distribute brief meeting minutes that cover decisions made and responsibility assignments.

CONCLUSION

Conferences and meetings are the most effective means of communication on any project. Unlike letters and memos, they allow for discussion, debate, and immediate response. They stimulate thought. They produce immediate results and permit the formulation of action plans right on the spot. For any conference or meeting to work, however, the project manager must be prepared and organized and be ready to project an image of confident leadership.

CHAPTER 21 MOTIVATION AND LEADERSHIP

NOTES

MOTIVATION AND PROFITABILITY

Everyone works best when motivated. Motivation is why so many people are intensely devoted to their hobbies—and are so successful at them. It is also the secret behind those who are best at their jobs. A person who loves his job is driven to do that job well.

Of course, money has a lot to do with motivation on the job. Earning a good income and having job security are at the top of the list of factors that motivate most people to work. But, more and more, people are realizing that financial gain is not the only motivator. Other motivators include:

- Social status and the respect of peers
- Challenge and a sense of achievement
- Being treated as an individual
- Having ideas listened to and contributions to the work effort respected, and
- Having fair, diligent, knowledgeable and responsive supervision.

It shouldn't surprise you that the degree of team motivation on a project dramatically affects job profitability. The reasons are straightforward:

- Motivated individuals commit themselves to becoming good at their jobs and take pride in the results of their work thus ensuring excellent quality control
- Motivated crews have the highest productivity because their pride drives them to "beat the schedule," and
- Motivated teams are innovative, constantly designing new ways to improve efficiency.

For these reasons, it's important that the project manager learn how to motivate the project team.

MOTIVATION AND LEADERSHIP

The relationship between motivation and leadership is direct and immediate. Leadership is the combination of abilities, attitude, and behavior that wins the respect of subordinates and motivates them to assist the leader in getting the job done. It has nothing to do with forcing people to work. There's a big difference—in the attitude involved, and the results achieved.

Leadership is absolutely necessary for team motivation. It creates motivation, stimulates the self-motivating engine in every individual, and focuses motivation on the job at hand. It also removes obstacles to motivation by resolving conflicts, eliminating frustration, and providing the resources that the team needs to get the job done as efficiently as possible.

THE CHALLENGE TO THE PROJECT MANAGER

Many people believe that leadership is an inborn trait. It is not. Leadership is a skill that must be learned. The challenge to the project manager, then, is to develop in himself those abilities, attitudes, and behaviors that enable him to motivate his project team.

Among the elements of successful leadership are:

- Knowledge of your job. Those under you must recognize that you are technically competent and prepared for every job you undertake. Confidence in leadership is essential for team motivation.
- Self-discipline. Stick to the business at hand by:
  - Keeping your attention and efforts focused on what's important
  - Controlling your temper in front of the team, and
  - Avoiding public criticism of company management, the general contractor, the project owner, or anyone else on the job. If you blame others for problems, the

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project team will come to believe that you are powerless, and your authority on the job will dissolve.

- Giving good instructions. Give instructions that are clear and complete. Make sure everyone understands exactly what you expect and that what you are asking is reasonable. Vague or unreasonable goals and instructions destroy team morale.
- Following up. After giving instructions, check regularly to make sure they are being followed. It demonstrates that you enforce the instructions you give.
- Recognizing achievement. Give outstanding work the recognition it deserves. Even the toughest veteran on the team has an emotional need for recognition and well-deserved recognition given in the presence of others is especially rewarding.
- Inviting input. Your company doesn't simply hire bodies. It hires brains, too, and a project manager who doesn't take advantage of the experience, knowledge, and creativity of his team is causing morale problems as well as overlooking a powerful resource. To avoid this:
  - Invite all members of the project team to think and to share their ideas, and
  - Let every person on the team know that his or her contributions are welcome and important.
- Delegating responsibility. Project managers who try to do everything on their own overwork themselves and develop in their teams an attitude of irresponsibility. Delegate responsibility to those who have proven themselves. They will appreciate your confidence in them, gain recognition from their peers, and usually work harder to prove themselves worthy of your trust. Using the additional time to plan and manage the project will make you a more effective leader.
- Exerting discipline. The purpose of discipline is to improve a person's future conduct by pointing out errors in his present conduct and is a necessary part of leadership. However, you should follow certain precautions when reprimanding anyone:
  - Give reprimands in private, not in the presence of others
  - Give the person an opportunity to tell his side of the story, and
  - Never lose your temper.
- Communication. "Communication" is such an overused word that we forget an important fact: the reason it is overused is because it is so important. Without communication, there is no leadership. Make every effort to:
  - Communicate clearly and be a good listener
  - Boost your team's esteem by explaining company plans and goals to them and making them feel a part of the overall company effort
  - Build the team's pride in the company by emphasizing the company's reputation for craftsmanship and quality service
  - Listen to their work-related problems, complaints, and suggestions, and be sensitive and responsive to them, and
  - Don't just answer questions; ask them. Asking questions demonstrates your interest in the person you're asking and the thing you're asking about.
- Consistency. Set standards and stick to them. Everybody needs a clear idea of what you expect and how you measure performance. Inconsistency leads to confusion and fear of unwarranted and unexpected reprimands.
- Positive attitude. Maintain a positive, results-oriented attitude. Look at problems as challenges, and unexpected situations as opportunities. A "we can do it, we can solve it" attitude is infectious. Team members catch it from their leaders, and it welds them together and gives them terrific confidence and morale.
- Profit orientation. You work to earn a living. Your living—and that of everyone on your team—depends on the company making a profit. It's important that everyone on the team understands that fact and realizes that his efforts really do affect company profitability. It's important for you, as project manager, to emphasize that:
  - In most cases, an employee's concept of how much profit the company makes is greatly exaggerated. A specialty contractor's net profit on even the most successful project rarely climbs above a few percent of the amount billed.

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- Without profits, the company cannot remain in business and continue to employ its workers
- Everyone's commitment to the job helps boost productivity and maximize profits
- Man-hours are money. A job that takes longer than expected can lose money.
- Materials are money. Wasted materials can reduce company profits.

These twelve points are important foundation stones in building your leadership skills, but they are not the only ones. If you plan to make management your career, you should study leadership by attending seminars and workshops, taking courses, reading books on the topic, viewing education video programs and listening to audio tapes. The only way to become a good leader is to know and master what is involved.

THE ROLE OF COMMUNICATION

Good communication skills are at the core of leadership. For this reason, the project manager must understand the communication process and how it relates to motivation and management.

See Chapter 19 of this manual for a good overview of the topic as well as recommendations for enhancing communication on every project.

CONCLUSION

Construction is a people activity. Consequently, the human factor figures prominently in the success or failure of any project. Good leadership aims at motivating the people involved, strengthening individual and team commitment, and generally ensuring that the human factor is a positive, rather than a negative, influence on the job and its outcome.

CHAPTER 22 SUBCONTRACTORS

NOTES

THE IMPORTANCE OF SUBCONTRACTORS

Subcontractors are a vital element in any construction project. Finding a subcontractor that does high caliber work at a fair price is important. Maintaining good relations with that subcontractor is just as important, as are coordinating his efforts with those of the rest of the project team and monitoring his progress on the job.

SUBCONTRACTOR PARTICIPATION

Few conflicts arise between a subcontractor and the rest of the project team if that subcontractor is made a part of the team from the beginning. Involving him in pre-planning (and later in short interval planning) enhances the entire project effort by:

- Establishing two-way communications with the subcontractor right from the start
- Utilizing the subcontractor's experience and expertise, and
- Making the subcontractor a functioning member of the project team, with a stake in the profitable completion of the project.

ASSIGNING RESPONSIBILITIES

The project manager has to make sure that he assigns responsibilities for keeping each subcontractor fully informed, handling situations that arise, and monitoring each subcontractor's progress and quality control.

To do this, the pre-planning meeting should devote time to answering the following questions:

- Who is authorized to give orders to the subcontractors?
- Who must approve subcontractor drawings before work can begin?
- Who is the subcontractor's daily contact on the job?
- Who coordinates the efforts of the subcontractors and your crews to ensure a smooth installation process?
- Who is responsible for monitoring the progress and the quality control of the subcontractor?
- Who handles conflicts arising between the contractor's field personnel and the subcontractor's field personnel?

THE JOB SUPERVISOR'S RESPONSIBILITIES

Because the job supervisor has the most regular contact with the subcontractor and his people, the project manager should assign the bulk of these responsibilities to him. He should also instruct the job supervisor to:

- Remember that every subcontractor on the job is working for your company and should be treated with the same respect and fairness as other employees
- Read and thoroughly understand each subcontractor's contract and be familiar with pertinent submittal data and specifications
- Consult with you if he has questions about a subcontractor's obligations
- Share all job-related information with the subcontractors' foremen and not try to decide what is of interest or concern to them
- Involve all subcontractors in the planning and coordination process
- Maintain good working relationships with each subcontractor to ensure cooperation, quality craftsmanship, and economy on the current project and in the future
- Make sure that each subcontractor receives, unloads, and properly stores all equipment that your company furnishes for him to install
- Insist that each subcontractor updates as-built drawings daily

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- Monitor all subcontractors' progress, and consult with each one to resolve problems and conflicts that affect timely installation, and
- Regularly submit information on each subcontractor's progress, for use in both preparing the monthly progress bill and keeping your company posted on the subcontractors' adherence to the project schedule.

CONCLUSION

Subcontractors often perform a significant portion of the work involved in a typical construction project. This makes them responsible for a considerable share of the job's profits. It also gives them the right to recognition when they complete their work successfully.

NOTES

BASIC PROJECT SCHEDULES

There are three very basic project schedules that need to be prepared. They are defined as follows:

- Bid Schedule. This is your commitment to meet the overall project schedule requirements as defined in the bid documents. It is usually not detailed; it may only be a commitment to complete your work by a specific date, or in so many workdays, and if more detail is needed, may include several milestones. This is very important, because it is your contractual commitment to complete your work within specified time frames. It is usually prepared by the project manager/estimator in consultation with your company scheduler, a field superintendent, and your supervisor.
- Detail Construction Schedule. This should be prepared by the entire project team and should be used for schedule control during project execution. It is described in more detail later in this section.
- As-built Schedule. This is the detail construction schedule, modified to reflect when work was actually accomplished.

Scheduling serves five purposes:

- It gives the project team a blueprint for coordinating the resources (labor, materials and equipment, tools, subcontractors, storage facilities, etc.) and secondary activities (prefabrication, purchasing, material handling, inspection and testing, etc.) necessary for completing each job activity on time to meet the overall project requirements.
- It provides a time scale for monitoring job progress and adjusting activities as necessary to make sure that the project as a whole is completed on time.
- It enables the contractor to assume leadership of the entire project schedule. A comprehensive construction schedule demonstrates the project team's capabilities and degree of organization, and a general contractor will often adopt it as basis for overall project schedule, thereby giving your trade activities priority and making the project manager's job easier.
- It enables you to compare the three basic types of schedules, as defined above, for the basis of a change order or claim, if the changes in the schedule resulted in increased costs and were caused by the general contractor, his subcontractors, or by the owner.
- It should be used to analyze the project cash flow, forecasting by month your expenses, billings, and income.

In today's world of market driven projects, almost every project is involved in schedule acceleration and compression. When this occurs, these basic schedules serve as a basis for evaluating the increase costs resulting from less time available to complete the contract requirements. It is very difficult to verify cost increases unless a comparison between the original schedule and the shorter schedule can be made.

The following are some of the items which may result in cost increases and need to be analyzed in order to determine the total cost impact;

- Rescheduling
- Material handling, purchasing
- Labor productivity losses due to stacking of trades
- Increased crew sizes
- Changes in planned activities
- Overtime, and
- Shift work.

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Several schedules covering different work scopes and activities, are needed for every construction project. Some of these include:

- Bid schedule
- General contractor's master schedule
- Subcontractor construction schedule
- Labor and job supervision schedule
- Prefabrication schedule
- Purchasing and delivery schedule
- Tools and equipment schedule
- Subcontractor schedule, and
- As-built schedule.

None of these schedules stands alone. Each is related to all the others. Consequently, the project manager must not only make sure that each of these schedules is complete in itself but that it meshes smoothly with the other schedules.

Note that this section of the manual discusses the use of bar graphs only.

WHO DOES SCHEDULING AND WHEN?

Because it must take into account virtually every aspect of the project, scheduling can be a very complex activity, particularly on large projects. For this reason, it requires the cooperation and participation of everyone on the project team.

Initial schedules should be prepared during the pre-planning meeting, when the entire project team is together and can focus its attention on the effort. As construction progresses, the schedules will undoubtedly require revision as unforeseen situations arise. Adjustments should also be a team effort, since a change to one schedule almost certainly affects the other schedules as well. Short interval planning meetings (see Chapter 9) and job conferences (see Chapter 20) are ideal opportunities for regularly reviewing and modifying job schedules.

It is essential that one person on the team is responsible for updating the schedules as necessary and letting everyone know what changes are made. In some companies, there is a designated individual. In others, the project manager has this responsibility. In any case, written notification of each schedule change must be given to every project team member as soon as the change is made. To avoid confusion, each revised schedule should be dated and should list the previous schedule(s) it replaces.

THE DETAIL SUBCONTRACTOR CONSTRUCTION SCHEDULE

The detail subcontractor construction schedule identifies the construction activities for which the project team is responsible and places them into a sequence that takes full advantage of company resources and the overall project schedule. It is the foundation of all the other project schedules.

The procedure for preparing the detail subcontractor construction schedule involves four steps.

- Review general contractor's schedule
  - Is there an overall project schedule?
  - Are there specified milestone dates?
  - Is it complete?
  - Is it feasible?
  - Does it adequately allow for completion of contract activities?
  - What clarifications or information is necessary before you can design your schedule?
  - Are liquidated damages involved?
- Identify milestones for your activities
  - Project start date and completion date, and

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- Activities of other trades (steel contractor, concrete contractor, mechanical contractor, sheet metal contractor, electrical contractor, dry wall contractor, and others).

- Plot activities on a bar graph.
  A bar graph is a visual representation of each of the activities on a time scale (see Figure 23-1). Across the top is the time scale—in this case given in both calendar dates and the numbered weeks between the starting date (April 1) and the completion date (July 28) of the project. Below the time scale are the various activities, each plotted as a bar or a line.

  The length of each line represents the number of labor hours/days for a particular activity. For example, fabricating piping in the shop is estimated to take three weeks (April 21-May 12). If three workers are involved and each workweek is 40 hours long, this line represents 360 labor hours.

  The starting and ending points for each bar or line is determined from the general contractor's schedule, which provides "windows" for each activity. A window is the number of days or weeks within which a particular activity must be completed.

- Identify "float functions".
  Float functions are activities that can be started and completed any time within one or more windows in the general contractor's schedule. For example, Figure 23-1 shows that conduit work must be completed during the nine weeks between May 26 and July 28. However, if 480 labor hours are estimated for this activity; then there is insufficient time allowed in the nine weeks to complete this task. However, a two-man crew can complete it in six weeks. This gives the project team the option of starting conduit work any time between May 26 and June 6.

  Float functions allow for flexibility in scheduling. They give the project team room for adjusting to unforeseen situations and allow it to do certain jobs when conditions are most favorable, to extend lead times for such things as processing submittals, and to avoid problems such as working in congested areas.

PROJECT MANAGER'S RESPONSIBILITY

One of the primary responsibilities of the project manager is to execute the contract scope on schedule and at or below planned cost. Your ability to influence schedule and cost is very high at the beginning of the project, during planning, and decreases rapidly during the first 30% of the project time (see Figure 7-1). The project schedule and cost must be set very early and then executed.

The Labor and Job Supervision Schedule

The purpose of a labor and job supervision schedule is two-fold:

- To insure that the project always has enough of the right people to do the work, and
- To avoid unnecessary fluctuations in labor and job supervision load during the course of the project.

The procedure begins with the detail construction schedule and the project labor breakdown and involves three steps:

- Plot a bar graph based on the detail construction schedule.
  As in the detail construction schedule, the length of each bar indicates the available duration of a particular activity. In addition, each bar shows the number of men assigned to a task. The horizontal scale is the same scale used in the activities schedule. The vertical scale indicates numbers of workers and supervisors. All of the available time may not be used, if work efficiency indicates a larger crew for a shorter time period or other variations in order to best utilize your company resources (see Figure 23-2).

- Analyze labor usage shown by bar graph.

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Once the labor and job supervision requirements for each task are plotted, it is easy to calculate the overall manpower required for each week of the project. Consider week 12 (June 23-30) of the project shown in Figure 23-2. The thickness of the bars shows that, during that week, the labor requirements are:

- 4 workers for field work
- 4 workers to erect piping
- 2 workers for duct work
- 2 workers for conduit work
- 2 workers for insulation
- 2 workers for erecting and testing.

As currently scheduled, then, the 12th week of the project requires a total of 16 workers and 3 supervisors on site. Compare this to the 10th week (June 9-16) and the 14th (July 7-14), and you see immediately that the manpower requirements fluctuate dramatically. Does this reflect the most efficient use of company personnel? Obviously not.

- If necessary, modify both your activities schedule and the labor and supervision bar graph until you attain a schedule that best uses company labor. In modifying the schedules, you have two major objectives:
  - Attain a fairly even manpower load throughout the project, and
  - Make sure that right number of people with the right qualifications are on site when required.

Meeting these objectives is a juggling act that requires judicious use of float functions, knowledge of available personnel, and sometimes the cooperation of the general contractor in modifying the overall project schedule. Here again, team participation is essential, since it is virtually impossible for the project manager alone to know all the information he needs to design an optimum schedule.

PURCHASING AND DELIVERY SCHEDULES

The purpose of a purchasing and delivery schedule is to make certain that:

- All equipment and materials are delivered on time, and
- The project gets the best price and terms on all purchases.

The procedure is very similar to that used in scheduling your activities and labor and supervision requirements:

- Prepare comprehensive list of items to be purchased, including:
  - Equipment to be installed
  - Materials
  - Subcontracts, and
  - Other direct cost items.
- Examine the conditions affecting purchasing for the project, such as:
  - Is the client paying for stored as well as installed materials?
  - Does the supplier require all-at-once delivery to ensure the lowest price?
- Plot purchasing and delivery activities on a bar graph that uses the same scale as the your activities schedule and the labor and supervision schedule, making sure to allow for:
  - Obtaining submittal data and getting it approved
  - Providing the lead time the supplier requires between ordering and delivery, and
  - Having big ticket items delivered as closely as possible to a regular project billing date

See Chapter 28 of this manual for additional information that the project manager should consider in scheduling purchases and deliveries.

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TOOLS AND CONSTRUCTION EQUIPMENT SCHEDULE

Here again, the purpose of scheduling is to ensure that project resources are available when needed and managed in the most effective way, particularly that:

- The right tools and construction equipment are on site when needed, and
- All special tools and rented equipment are returned to their source when they are no longer needed.

The procedure involves two straightforward steps:

- Identify the tool and equipment needs of the job, including requirements for:
  - Standard tools
  - Specialized tools and equipment, and
  - Rented tools and equipment.
- Plot a tool and equipment schedule on a bar graph, using the same time scale as that of the other schedules and specifying:
  - Deliveries of tools and equipment to the job site, and
  - Return of all tools and equipment from the job site to the company warehouse or the rental company.

See Chapters 33 and 34 for additional information to consider in scheduling tool and equipment requirements.

SUBCONTRACTOR SCHEDULE

A subcontractor schedule is essential to guaranteeing maximum productivity in all the subcontractors' efforts and smooth coordination of these efforts with your other activities. To be successful, the scheduling procedure must involve the subcontractors themselves. Their participation ensures that each one of them has a clear overview of the project and fully understands how his efforts will affect those of the other members of the project team.

When subcontractors perform a significant portion of the work it gives them enormous influence over the outcome of the project. Therefore, it is important to involve them in pre-planning, short interval planning, and all other activities that deal with project scheduling.

A good procedure for scheduling subcontractors is the following:

- Have each subcontractor supply information on:
  - Delivery dates and storage requirements for equipment, materials, and tools, and
  - Manpower requirements throughout the job.
- Plot a schedule for each subcontractor on a separate bar graph and on a master subcontractor schedule showing all subcontractor activities. Using the your activities the schedule, and the information supplied by the subcontractors, plot the bar graphs using the same time scale used in your activities schedule. Include on the graphs:
  - Deadlines for submittal of necessary drawings to contractor, and
  - Start dates and completion dates for each task.
- Analyze the master subcontractor schedule.
  - Does it coordinate subcontractor activities with your construction activities and the other trades?
  - Does it allow each subcontractor enough time and room to work productively, avoiding the "stacking" of trades in any job area at one time?

See Chapter 22 for additional information to consider in scheduling subcontracted activities.

SCHEDULING METHODS

Bar graphs are a useful tool in planning and graphically showing project time requirements and manpower loading. They are used by most trade contractors for planning and are also an effective means of communicating with field personnel and other contractors. However, they have their limitations on larger more complex projects, in which cases it may be advisable to go

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to a network scheduling technique. The most common network scheduling system is "Critical Path Method," which is used by many general contractors and is now a specified requirement on many larger projects. There are many very good network-scheduling systems, custom tailored for the construction industry. Computers are ideal for simplifying and speeding up the complex process of network scheduling and most of them will also produce bar graphs and manpower loading charts. You can get information on some of these programs by contacting your local Alliance trade association.

CONCLUSION

At the end of the procedures outline in this section, the project team has in hand a set of bar graphs that visually depict all aspects of the job on the same time scale. This set of graphs is invaluable. It makes short interval planning and job monitoring easier, helps everyone to see the interrelationships of their responsibilities and schedules, and allows the project manager to see at a glance how a delay or other unexpected event affects all aspects of the work.

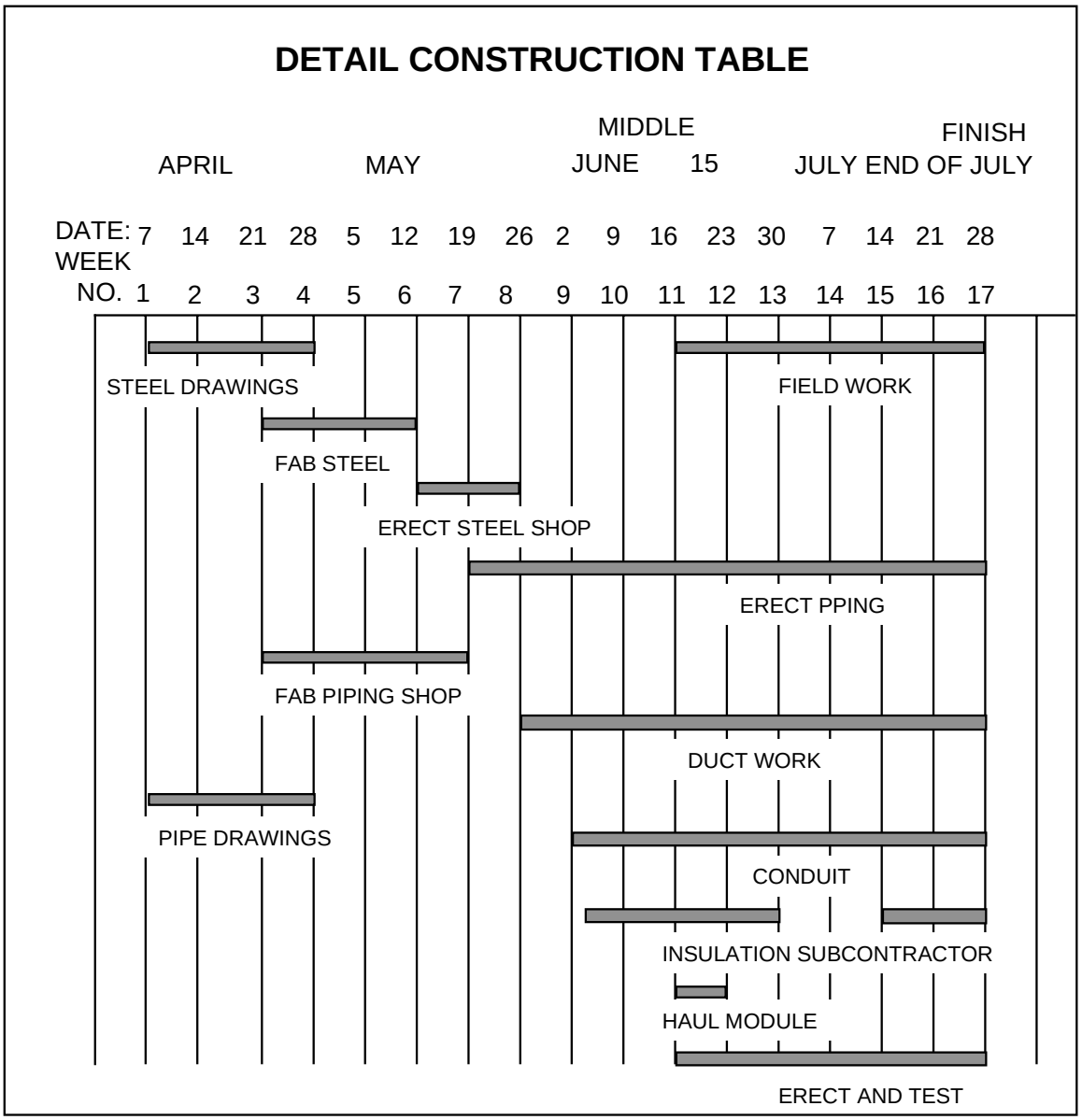

Figure 23-1 Sample Construction Bar Graph Schedule

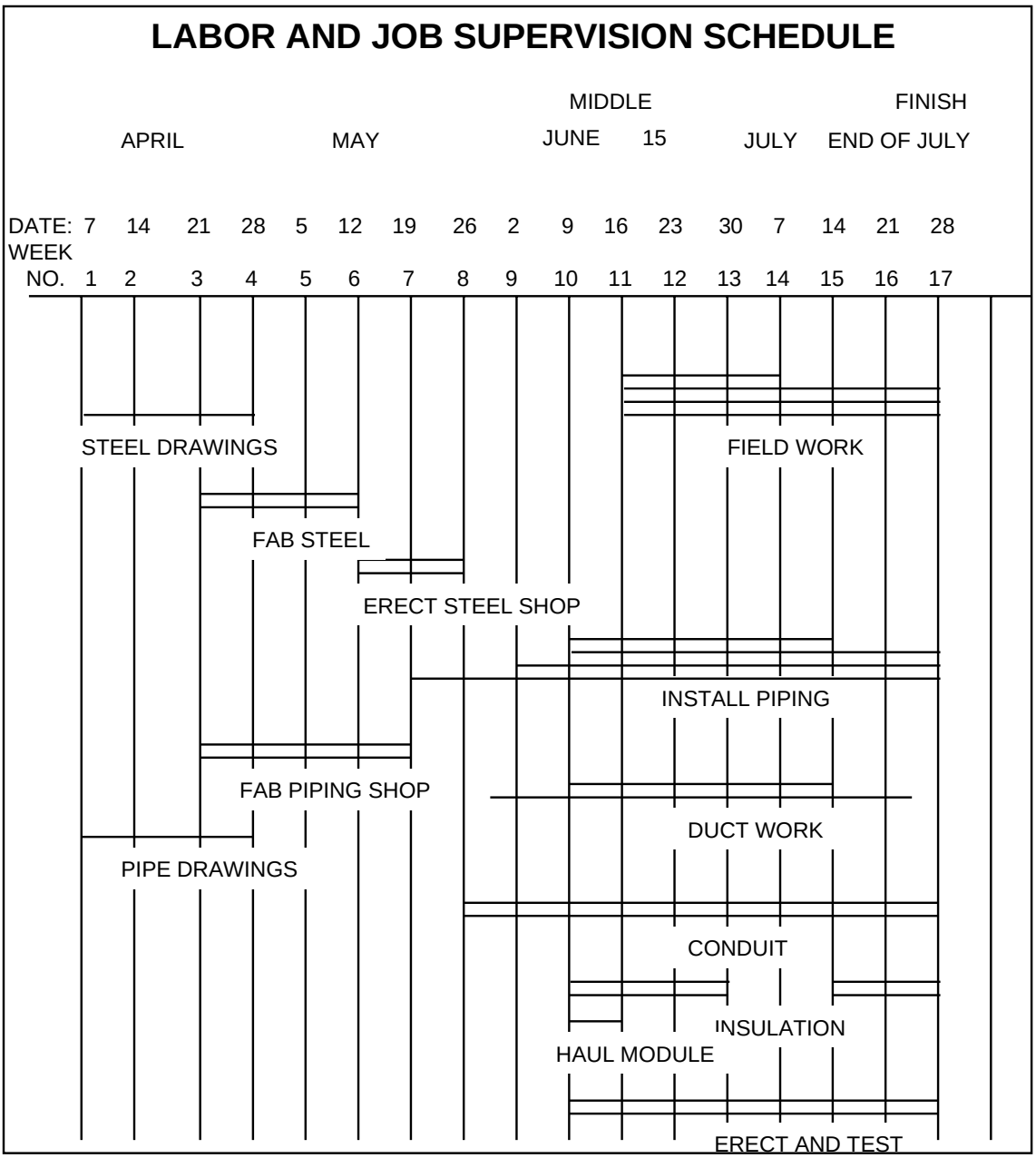

Figure 23-2 Sample Labor and Job Supervision Bar Graph Schedule

CHAPTER 24 DOCUMENTATION

NOTES

THE IMPORTANCE OF DOCUMENTING THE PROJECT

Regardless of its size, a construction project is a maze of details and decisions, successes and errors. To stay on track and to accumulate knowledge to use in managing future projects, the project manager has to keep complete records of job events, situations, and activities. He can't rely on his memory, or anyone else's, six months from now when he needs facts to answer a question from the owner or defend himself in a claim dispute.

At the same time, the company itself has to know why certain project strategies worked and why others did not, so that successes can be repeated on other projects and failures can be avoided. Without this knowledge, everyone in the company—from the estimator to the job foreman—is forced to reinvent the wheel on every project, doomed to working by trial and error, unable to significantly improve their performance or the company's profits.

THE GOALS OF DOCUMENTATION

There are four goals in project documentation:

- To create a regular and reliable flow of information about the project, thereby keeping everyone on the project team informed about job progress, problems, and potentials, and giving the project manager necessary data for modifying project strategies as necessary
- To maintain a comprehensive and accurate history of the job for use in estimating, planning, and managing future projects
- To record the construction details of the job as built so that accurate technical information is available for operation, maintenance and servicing of the systems, and
- To establish a set of documents that can be used to verify the actions and decisions of the project team in a claim or dispute.

To meet these goals, your company should establish a standard set of document forms and procedures for using them.

A PRACTICAL STRATEGY

Like every other aspect of a project, documentation must be planned. It is not enough simply to grab a handful of company forms from the file and assign someone responsibility for filling them out. This planning should be part of the preplanning effort and continue through short interval planning.

The steps in pre-planning documentation are:

- Review the documentation requirements of the project, assessing the need and format for:
  - Daily logs (see Figure 15-1 and Figure 24-2)
  - Labor reports (see Figure 15-2)
  - As-built drawings
  - Change order request and approval forms (see Figure 14-1)
  - Change order log (see Figure 14-6)
  - Forms for costs incurred doing time and materials changes (see Figure 14-3)
  - Purchase orders
  - Delivery records
  - Installation instructions
  - Request for Information (see Figure 24-3 and Figure 24-4)
  - Submittal Log
  - Operation and maintenance manuals
  - Warranties
  - Correspondence

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- Transmittal records (see Figure 24-5)
- Other required documents.

In most cases, you can use your company's standard forms and procedures for these documents. In other cases, the project owner or the general contractor will have specific forms for you to use.

- Emphasize the advantages of documenting tasks as you do them.
  Emphasize to everyone on the project team the importance of filling out the necessary forms as they go along to avoid relying on their memories and leaving an enormous load of paperwork at the end of the project. Point out also that documents written and signed the same day as an event occurs are more reliable as evidence in dispute cases than documents prepared days or weeks after the fact.
- Assign specific responsibilities to individual team members.
  Make documenting the job part of every team member's job description. Make your assignments specific and assign them proper priority. Before the project starts, be certain every team member understands his responsibilities and the proper procedures for completing the required forms.
- Read and use the documents prepared for you.
  The quickest way to defeat a good project documentation strategy is to ignore the reports submitted by the project team. Once a person knows that you don't bother to read what he writes, he soon becomes lazy or sloppy in preparing his reports. To avoid this, read each report submitted to you. Note points that are incomplete or unclear and ask for additional information. Act on recommendations and questions contained in the reports. In short, let everyone on the team know that his effort on the paperwork is not wasted.

THE BIG FIVE

Five categories of project documents are particularly important:

- Project Manager's Site Visit Report (see Figure 24-1)
- Daily Job Log (see Figure 24-2)
- Request for Information (see Figure 24-3 and Figure 24-4)
- Field-Authorized Change Order form (see Figure 14-3), and
- Equipment Documentation.

Project Manager's Site Visit Report

The Site Visit Report (see Figure 24-1) is a report completed by the project manager as part of his regular job site inspection routine. During his inspection tour, the report provides a list of items to check. Afterward, it becomes a first-hand record of current job progress and job site conditions.

As a record, the Site Visit Report is important for two reasons:

- It provides data for short interval planning, and
- It serves as a vehicle of communication with the job supervisors, the subcontractors and the customer.

The project manager should complete a Site Visit Report at least once a month. Whenever possible, he should insist that the job supervisor(s) or foremen accompany him on his inspection tour, so that situations can be discussed right on the spot.

After the tour, he should make copies of the completed report form and:

- Place at least one copy in the project file
- Distribute copies to appropriate field and office personnel
- Use the report to prepare memos or other notifications of job situations to subcontractors, other trades and the customer, and
- Use the report as a basis for the next short interval planning meeting

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Daily Job Log

Purpose and Importance

The Daily Job Log is a record of each day's job activities and events recorded by the job supervisor or foreman. It is the single most important document on any project, serving four major purposes:

- To create a thorough, accurate history of the project for planning future projects
- To document the company's positions in claims and disputes
- To alert the project manager and office personnel to job situations requiring immediate attention, and
- To provide a standardized daily means of written communication between the office and the field.

The Job Supervisor's Responsibilities

Because the Daily Job Log is so critical, the project manager should make every effort to ensure that the job supervisor understands its importance and knows the proper procedures for completing the Daily Job Log form. In particular, the supervisor must understand that:

- He must complete and submit a Daily Job Log form daily, even if he keeps his own personal diary of job activities and situations
- He must include in each report all the events of the day, both favorable and unfavorable
- He must describe all job events and conditions accurately and realistically
- He should use the "Questions/Comments for Office" section of the form for communicating with the office, and
- He must sign and date the form before submitting it to the office.

At the same time, the project manager should emphasize to the job supervisor that the Daily Job Log is not:

- An attempt to describe unfavorable job situations in a favorable light, or
- A spelling or grammar test.

The idea is to make sure that the job supervisor is comfortable with being honest in his reporting and expressing his observations, ideas, and questions in his own way.

The Project Manager's Responsibilities

The project manager has specific responsibilities regarding the Daily Job Log, namely:

- To provide the job supervisor with all the materials he needs to submit accurate and complete reports, including report forms, stamped envelopes addressed to the company office (if he is to mail each Daily Job Log), and a Polaroid camera or videotape camera for recording job progress and conditions
- To properly train the job supervisor in completing the necessary forms, operating the camera(s), etc.
- To review each completed Daily Job Log the day he receives it
- To act on the information in each Daily Job Log
- To establish a policy of responding as soon as possible to any questions in the Questions/Comments for Office" section of the form
- To contact the job supervisor for clarification of any unclear or incomplete information in the Daily Job Log, and
- To use the information on the completed forms for short interval planning, tracking job progress, identifying claim situations as they develop, documenting claims and communicating with the customer, the subcontractors, and other trades.

Only if the project manager meets his responsibilities can he expect the job supervisor to do the same.

NOTES

Completing the Form

A sample Daily Job Log Form is found in Figure 24-2. It may vary from the report form used by your company. If so, it should be replaced with a copy of your company's form and the instructions for completing it.

As an example of the kind of detailed instructions the project manager should give his job supervisors, the following is a set of instructions for completing the sample Daily Job Log Form in Figure 24-2.

- Job. Fill in the job name and project number.
- Date. The date of the events described. The log is useless unless it is dated.
- Weather. Because weather can drastically affect job activities, this information is very important, especially if the report is used in legal proceedings involving a claim.
- Manpower. In the appropriate spaces, fill in the number of workers (plumbers, fitters, apprentices, subcontractors' employees, electricians, etc.) on the job.
- Rental Equipment. List all rented equipment on the job.
- Deliveries Received.
  - List all freight shipments received, being as specific as possible
  - Note any shortages or damaged items in any shipment, and
  - If damaged items were received, see Chapter 31 for further instructions.
- Delays. In the appropriate sections:
  - State whether your company is delaying other contractors' activities on the job or other companies are delaying your activities
  - Identify the parties involved and list the names of the people you've discussed the problem with, and
  - If further explanation is needed, use a separate sheet to provide it.
    This section of the form is particularly important if a delay claim is filed.
- Verbal Instructions. If you are given verbal instructions by the owner, the architect, the engineer, the general contractor or construction manager, or an inspector:
  - Record those instructions in adequate detail
  - Have the person who issued the instructions verify them by signing this section of the report, and
  - Do not proceed on those instructions until you have received authorization from your project manager.
- Safety. This section is extremely important.
  - List all accidents—minor and major—in detail, specifying time, location, person(s) involved, extent of injury, first aid action taken, etc.
  - Fill out a separate OSHA (or other approved) accident report form for each accident that occurs on the job. No Workman's Compensation claim is processed unless an approved form is filed.
  - Document all job safety meetings, including information on date, time, attendees and meeting topic. For further details, see Chapter 17 of this manual.
- Visitors. It is important to log all visitors who enter the job site, specifying:
  - The visitor's name and the name of the firm or organization that he or she represents
  - Times of arrival and departure, and
  - The purpose of the visit and any significant incidents that may have occurred.

  Information about visitors can be important during legal proceedings.
- Photographs.
  - Include with your report photographs of significant job conditions or events, and
  - On the back of each photograph note the date it was taken and what the photograph is intended to show.
- Questions/Comments for Office.
  - If you have questions, remarks, suggestions, requests, or other items for your company's office staff, list them here
  - If appropriate, address your questions and comments to a particular person, and

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  - If your question or comment is urgent, telephone the office for a quick response.
- Signature & Date. Be sure to sign the report and note the date on which you completed it. Without your signature, it is not a legal document.

Once you have completed the form:

- Keep a copy of it for your records, and
- Mail or deliver it to your company office.

Request for Information (RFI)

All requests for information should be written. See Figure 24-3 for a sample RFI. All RFI's should be recorded in an RFI log similar to Figure 24-4, and tracked to be sure the request is answered. This is simply stated, but is extremely important. With out good RFI documentation, confusion will result and you will loose control of the project.

Field-Authorized Change Order Form

Purpose

A Field-Authorized Change Order form is used for two purposes:

- To obtain written authorization for change work requested by the project owner, the general contractor, or other project authority, and
- To track all labor, materials, and tools and equipment used in doing change work.

Procedures

Procedures for properly using a Field-Authorized Change Order form begin with everyone on the project team, especially field personnel, following the company's procedures for change orders in general. Specifically:

- Do not begin any change work until the order for that work is approved by the project manager
- Request that any change ordered by the project owner, project architect or engineer, or general contractor be given in writing
- If the schedule requires the job supervisor to begin work on a change before written approval is received from the owner, design professional, or general contractor, he must note that fact in the day's Daily Job Log
- If the job supervisor feels he is being asked to do work that is outside the mechanical contractor's scope of work, he should contact his project manager immediately
- All direct and indirect costs of change work must be accurately recorded and carefully tracked, both to provide billing information for time and material (cost-plus) change work and to provide a historical record for use in estimating costs for future change work, and
- All change orders must be recorded and tracked on a change order log.

See Chapter 14 for a full discussion of change order procedures. Also in that section are:

- A sample Field-Authorized Change Order and instructions for completing it, and
- A sample Change Order Log.

Equipment Documentation

Equipment documentation includes all written materials required for installing, testing and operating equipment installed by the contractor or his subcontractors. Procedures for these processes may be found in the appropriate chapters of this manual.

LETTER OF TRANSMITTAL

A standard form (see Figure 24-5), is a very useful tool in documenting all kinds of transmittals, and when used, can also save considerable time in providing adequate documentation.

NOTES

CONCLUSION

Without comprehensive and accurate job records, the project manager is working in the dark, not only on the current project but in the planning of future projects as well. At the same time, lack of good documentation leaves the company virtually defenseless when claims or disputes arise.

Maintaining good job records is not a difficult task, but is a detailed and sometimes tedious one. To sustain the project team's efforts on project documentation, the project manager must make it clear that the paperwork is appreciated and contributes to the effective management of the job.

PROJECT MANAGER'S SITE VISIT REPORT				
Job No.	Job Name			Date
Job Foreman			Project Manager	
GENERAL CONDITION OF JOB		**YES**	**NO**	**EXPLANATION OF PROBLEMS AND ACTION TO BE TAKEN**
1	Job shack in order?			
2	Storage yard in order?			
3	Vehicles properly maintained?			
4	Material properly stored?			
5	Plans & specs in order?			
6	Shop drawings in order?			
7	As builts current?			
8	Job filing in order?			
	SAFETY			
9	Hard hats being used?			
10	Accident reports current?			
11	Hand rails provided?			
12	Fire extinguishers in proper locations?			
13	Gas boilers stored properly?			
14	Ditching & storing in compliance?			
15	Safety posters properly posted?			
16	First Aid kit properly maintained?			
17	Overall job in compliance?			
	JOB SCHEDULE			
18	Are we delaying others?			
19	Are others delaying us?			
20	Has job schedule changed since last review?			
	CREW SIZE			
21	Is actual crew size as scheduled?			
	CHANGE ORDER STATUS			
22	Change Order Recap renewed?			
23	Are there any field C.O.'s in progress?			

Figure 24-1 Project Manager's Site Visit Report (Sheet 1 of 3)

24	Are there any C.O.'s by others affecting us?			
	SUBCONTRACTOR'S PERFORMANCE			
25	Control sub performing properly?			
26	Insulation sub performing properly?			
27	Sheetmetal sub performing properly?			
28	Sprinkler sub performing properly?			
29	_____ sub performing properly?			
	TEST REPORTS			
30	Test reports current?			
31	Test reports being signed by proper authority?			
	MATERIAL SHORTAGES/NEEDS			
32	Are there any items that have been ordered that you haven't received?			
33	Are you short material that hasn't been ordered?			
	EQUIPMENT			
34	Have you received approved submittal data on all equipment?			
35	Are scheduled equipment shipping dates compatible with job schedule?			
36	Has equipment been received complete?			
37	Has equipment been received undamaged?			
	CONSTRUCTION EQUIPMENT			
38	Is company equipment on the job needed?			
39	Is rented equip on the job needed?			
40	Is adequate equipment on the job?			
	LABOR REPORT			
41	Has labor been reviewed?			

Figure 24-1 Project Manager's Site Visit Report (Sheet 2 of 3)

42	Have vacancies been discussed?			
43	Has proper action been discussed with regard to negative variances?			
	SPECIFIC JOB PROBLEMS			
44	Weather?			
45	Schedule?			
46	Coordination?			
47	Deliveries?			
48	Inspections?			
49	Changes?			
50	“Holds”?			
	JOB MORALE			
51	Is our job morale good?			
52	Is the GC job morale good?			

PROJECT MANAGER’S GENERAL REMARKS

Figure 24-1 Project Manager’s Site Visit Report (Sheet 3 of 3)

DAILY JOB LOG						
1.	Job			2.	Date	
3.	Weather				(Temperature)	
4.	Manpower		Others		Subcontractors:	
		Foreman				Sheet Metal
		Mechanics				Insulation
		Apprentices				Control
		Laborers				Sprinklers
		Helpers				
5.	Rental Equipment on Job					
6.	Deliveries Received					
	Supplier		Carrier		Item(s)	Damages/Shortages
7.	Delays					
8.	Verbal Instructions Received					
					From	
9.	Safety					
	Accident Information					
	Is an Accident Report Attached?					
	Safety Meeting Information					
10.	Visitors		Company/Organization		Purpose	Time In/Out
	Name					
	Comments					
11.	Photographs: Number of photographs attached					
	Is the subject described on the back of each photo?					
12.	Questions/Comments for Office					
					Date	
13.	Signature					

Figure 24-2 Sample Daily Job Log Form

REQUEST FOR INFORMATION (RFI) No.

OWNER:	**ROUTING**	**SENT**	**REC'D**
PROJECT:	TO		
Job No.	FROM		
CONTRACTOR:			

RFI TITLE:
REFERENCES:
DRAWING No.: LOCATION:
SPEC. SECTION:
OTHER:

********** **REQUEST** **********

THE FOLLOWING INFORMATION IS REQUESTED AS DESCRIBED BELOW OR IN THE ATTACHMENTS:
By: Of: Date:

********** **RESPONSE** **********

THE FOLLOWING INFORMATION IS PROVIDED AS DESCRIBED BELOW OR IN ATTACHMENTS:
BY: OF: DATE:
RFI #

Figure 24-3 Sample Request for Information

Alliance Contracting

Alliance Contracting Job No.
RFI LOG Printed

RFI No.	Date Submitted	Response Rec'd	RFI No.	RFI Title

Figure 24-4 Sample RFI Log

ALLIANCE CONTRACTING	**LETTER OF TRANSMITTTAL**	
	Date:	Job No.
TO:	Attention:	
	Re:	

WE ARE SENDING YOU ☐ Attached ☐ Under Separate Cover Via _____

The following items:

☐ Shop Drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications

☐ Copy of letter ☐ Change Order ☐ Other: _____

Copies	Date	No.	Description

THESE ARE TRANSMITTED AS CHECKED BELOW:

☐ For approval ☐ Approved as submitted ☐ Resubmit _____ copies for approval

☐ For your use ☐ Approved as noted ☐ Submit _____ copies for distribution

☐ As requested ☐ Returned for corrections ☐ Return _____ corrected prints.

☐ For review and comment ☐ Other _____

☐ FOR BIDS DUE: _____, 19____ ☐ PRINTS RETURNED AFTER LOAN TO US.

Remarks:

Copy to: _____	Signed:

Figure 24-5 Sample Transmittal Form

CHAPTER 25 EQUIPMENT DOCUMENTATION

NOTES

THE IMPORTANCE OF EQUIPMENT DOCUMENTATION

Installed equipment is a "big-ticket" item on most construction projects. Although the cost of each piece of equipment is established at the beginning of the project and therefore not considered a variable, the costs of obtaining and installing that equipment can prove volatile. The reason is that the process for specifying, purchasing, and handling installed equipment is often a complex process that allows costly errors.

One way to avoid costly errors related to installed equipment is to control equipment documentation. This includes control of:

- Purchase Order Number
- Submittal sheets
- Shop drawings
- Installation instructions
- Test reports
- Air and water balance reports
- As-built drawings
- Start-up notices
- Operation and maintenance manuals
- Warranty letters, and
- Maintenance contract proposals.

Several of these documents are covered in other sections of this manual (see Chapters 32, 41, 42, and 43, for more information). This section concentrates primarily on the procedures for handling submittals and tracking purchasing and receiving activities.

THE SUBMITTAL PROCESS

Submittal Sheets

Submittal sheets are documents compiled by the equipment vendor to provide the specialty contractor and his customer with a detailed description of a particular piece of equipment to be installed. They are the basis on which the contractor's customer approves the equipment for purchase and the contractor plans the installation.

The Submittal Process

The submittal process really begins with bidding the contract, when the contractor's estimator or purchasing agent reviews the project's plans and specifications, identifies the types of equipment to be installed, and contacts various vendors to get information on prices and availability.

Once the contractor is awarded the job, the project team takes over. They review the equipment requirements once again and determine when each piece of equipment must arrive at the job site in order to meet the installation schedule. Using these delivery dates the team can determine how much lead time it has for submitting a purchase order to the vendor, requesting and receiving submittal sheets, getting the submittals approved by the customer, and releasing the equipment for production and shipment.

Keep in mind that equipment can be released only when the submittals have been approved by the owner's engineer or other project authority, unless otherwise specified in the contract documents. When lead time is short, this means that the project manager must do whatever he can to expedite:

- Receiving submittal sheets from the vendors
- Sending them to the owner's engineer or other authority
- Getting that authority to act on them as quickly as possible

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- Resubmitting those sheets requiring corrections or modifications, and
- Submitting a material release in time to have the equipment delivered on schedule.

A delay at any stage in this paperwork cycle can lead to serious delays that affect the entire job schedule.

A TRACKING SYSTEM

To help the project team monitor progress of submittals, purchase orders and deliveries, the project manager should institute a system that tracks the paperwork for each piece of equipment to be installed on the job. On the following pages are several sample forms for that purpose. The project manager should assign one person on the project team to update each form daily, if necessary, and distribute updated forms weekly.

Equipment Tracking Form

The Equipment Tracking Form (see Figure 25-1) is a log showing all pertinent information for each piece of equipment needed, including vendor name and contact information, purchasing order number, dates of submittals, shipping date, and verification of delivery. During pre-planning, a master equipment schedule should be prepared and copies issued to the purchasing agent, the job supervisor, the fabrication shop foreman and others involved in the purchase or handling of the equipment. The schedule should be updated as needed and updated copies issued immediately so that everyone has the most current information at all times.

Contractor Submittal Log

The Contractor Submittal Log (see Figure 25-2) contains much of the same information as the Equipment Tracking, however, it's primary purpose is to track the movement of submittal documents. Here again, this form should be created during preplanning and updated regularly. Updates should be distributed as soon as possible.

The advantage of the Submittal Contractor Log is that it allows everyone on the project team to see at a glance how well each submittal is moving through the system. Delayed submittals can be spotted and expedited before they cause major schedule delays.

Transmittal Forms

Your company should have a standard form for transmitting submittals to the project's design and engineering authority (see Figure 24-5).

Construction Planning

Because they are detailed descriptions of the equipment to be installed, submittal sheets are a valuable planning tool. A job supervisor can use approved submittals to plan and install the rough-ins even before the arrival of the equipment and the manufacturer's installation instructions. Subcontractors should be given updated copies of submittal sheets to help them plan their work.

Although most engineering reviews of submittal sheets result in only minor changes to the rough-in plan, the project manager should instruct the job supervisor to use only approved submittals for doing rough-ins and provide the supervisor with a complete set of all approved submittals for that purpose. If the supervisor has no choice but to use unapproved submittals to do a rough-in, he should get approval from the project manager.

The same is true for fabrication. Although submittal data is helpful in making isometric and coordination drawings, it is not always accurate, unless the vendor/manufacturer has been notified that his submittal data is to be used for prefabrication and he certifies the accuracy of the dimensional data. Otherwise, fabrication of final pipe and duct connections should not be started until their dimensions and locations are verified when the equipment arrives.

NOTES

Installation

The project manager should insist that the job supervisor not use the submittal sheets alone as instructions for the actual installation of the equipment. He should instead follow the manufacturer's instructions as well as the submittals.

Receiving, Storage, and Handling

Submittal sheets are especially valuable for planning the receiving, unloading, storage, and handling of equipment, and they should be used for this purpose. When the equipment arrives, the job supervisor should verify that the equipment, as received, matches the description on the submittal. At the same time, he should locate the manufacturer's installation instructions (a set of instruction sheets is usually packaged with the equipment) and the operation and maintenance manuals and add them to the file folder for the equipment.

To assist the job supervisor in equipment planning, the project manager should provide him with a separate file folder for each major piece of equipment to be installed on the job, and encourage him to put all equipment information in its proper file folder as soon as he receives it.

CONCLUSION

Controlling equipment documentation is the first step toward efficiently managing the purchase, receipt, and installation of the equipment itself. Because so many people outside the company are involved in equipment documentation, however, the effort demands special attention and no small amount of diplomacy on the part of the project manager.

EQUIPMENT TRACKING

JOB NAME: JOB NO.

ITEM	VENDOR	MFGR.	REQ DATE	P.O. NO.	P.O. DATE	1ST SUBMIT	DWGS RET	2ND SUBMIT	DWGS RET	DWGS TO VENDOR	ITEM REQUEST	SHIP DATE	REC. PARTS AND MAINT MAN.	CONTACT	PHONE

Figure 25-1 Sample Equipment Tracking Form

John Wiley & Sons
CONSTRUCTION ENGINEERS
FORM BOOK by Edward Fisk
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CONTRACTOR SUBMITTAL LOG

Project:		Project Mgr.	
Job No.		Contractor	

Date Rec'd.	Transmittal No.	Description	Subcontractor / Ref. Spec. Section	Contractor Transmittal No.	No. Copies Rec'd.	Action: No Exceptions Taken	Action: Make Corrections Noted	Action: Revise and Resubmit	Action: Rejected	Date Req'd.	No. Copies Rec'd.	Remarks

Figure 25-2 Contractor Submittal Log

CHAPTER 26 GOALS AND GUIDELINES

NOTES

THE PURPOSE OF GOALS

To succeed, a business has to set long-term and short-term goals and design ways to meet them. These goals might be target profit figures for the coming year or the next five years. They might be potential clients that the company wants as regular customers. Whatever form they take, specific company goals give everyone in the company a sense of purpose and security and a yardstick by which to measure his performance and that of his team.

Each project must also have a set of goals, and these goals must fit into the overall business plans of the company. For example, the primary goal of a particular project might be to win an important new customer. If so, the company owner may have bid the job close to cost in order to get a foot in the door or he might consider meeting the schedule to be more important than meeting the budget.

To manage the project in such a way that it contributes to the company's long-term and short-term goals, the project manager must know what the goals of the project are. He especially must be aware of any "behind the scenes" factors that might influence the project team's strategy.

COMPANY GOALS, GUIDELINES AND MISSION STATEMENTS

Goals are the framework for all company activities. Guidelines are the policies and procedures a company establishes to help it meet its goals. They give everyone in the company a clear understanding of what is expected of him and general instructions for handling on-the-job situations.

A company often summarizes its goals and guidelines in a mission statement. A mission statement is a brief broad-brushed description of where the company is headed, how it views its market and its customers, and how its employees should act in pursuing company objectives.

JOB-SPECIFIC GOALS AND GUIDELINES

Before starting any job, the project manager should meet with the company's top management to discuss the objectives of the job. At the end of the meeting, he should have all the information he needs to understand not only the project's plans and specifications but its politics as well. He should share this information with the other members of the project team so that everyone has the same understanding of the job's priorities and special procedures. Only then can the team begin to plan a practical strategy that will not only accomplish the actual construction but also satisfy the company's goals.

CONCLUSION

The rationale for a company's policies and procedures becomes clear when viewed as a means for achieving a particular set of goals. Consequently, if everyone on the team understands the company's business goals and its goals for the project, the project manager will have a much easier time getting others to comply with and enforce those policies and procedures.

NOTES

PRODUCTIVITY AND PROFITS

Industry surveys tell us over and over again that most construction efforts are largely unproductive. On the average:

- Only about 40 percent of a mechanic's time each day is spent on productive work—fabrication, installation, and other activities that contribute to the actual construction of the job
- 30 percent of his time is spent on support activities—material handling, moving tools, obtaining instructions, and other activities that must be done in order for construction to take place, and
- The remaining 30 percent is simply unproductive time—socializing, waiting, and other activities that do not contribute to the project's successful completion.

When you realize that most payments to your company are based on percentages of completion, a dramatic truth becomes clear: your company gets reimbursed by the project owner for less than three and a half hours of each worker's day! The rest of the day (and the day's wages) come out of the company's pocket.

Suddenly you understand why the term "productivity" is often discussed in management seminars and textbooks and why industrial productivity is such an important indicator in each month's report on the U.S. economy. You realize why the higher productivity of workers in other nations is such a threat to America's position in the world marketplace and, on a more familiar scale, why your company is so concerned with the productivity of its work force.

The biggest difference between productivity and profitability is the way they are spelled.

DEFINITION

Productivity is a measure of how much of its potential a project team actually fulfills or, in the words of Webster's Third New International Dictionary, "The degree of effectiveness of industrial management in utilizing . . . labor and equipment."

What is interesting about the latter definition is that it pins responsibility for productivity squarely on management. This is absolutely correct. Productivity is a direct expression of management. It is a resource and is just as capable of being managed effectively (or ineffectively) as are materials, equipment, schedules, subcontractors, and all the other resources the project draws on.

FACTORS THAT AFFECT PRODUCTIVITY

Enhancing your team's productivity relies on your ability to recognize factors which contribute to and factors which hinder productive work.

Positive Factors

Among the factors that stimulate productivity are:

- Worker motivation
- Contractor's profit motive
- Pride of supervision
- Customer's desire for low cost
- Favorable national economic mood
- Favorable working conditions
- Good safety record
- Clear, understandable project requirements and drawings
- Effective preplanning of the project
- Availability of tools, material, and equipment

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- Established standard procedures
- Good communications and reliable information
- Foreman and worker participation in decision-making
- Aggressive but realistic project schedule
- Pride in workmanship
- Opportunities to learn
- Challenge of maintaining job schedule and job budget
- Satisfaction with building a structure
- Good relationships among members of team, and
- Feedback on performance (including recognition and rewards).

Some of these are within the team's control, others—the national economic mood, for instance—are not.

Negative Factors

Among the factors which hinder productivity are:

- Weak leadership
- Demotivating or pointless policies
- Weak support groups (warehouse, tool room, personnel department, etc.)
- Weak project design
- Unreasonable schedule
- Unskilled labor and management
- Suppression of innovation
- Lack of reliable information
- Poor communications
- Unavailability of tools, material, and equipment
- Management-labor relations problems
- Poor attitude of workers
- Unnecessary paperwork
- Poor planning and scheduling
- Inaccurate and insensitive feedback
- Personality conflicts
- Sloppy workmanship
- Repetitious and uninteresting work
- Dirty, cluttered work area, and
- Poor coordination of trades by general contractor.

As with the list of positive factors, this list is incomplete. There are many of other factors that affect productivity.

BASIC ELEMENTS OF PRODUCTIVITY MANAGEMENT

Most of what is involved in good productivity management is common sense. It all comes down to your ability to manage and coordinate the basic resources of the project, namely:

- People
- Materials
- Facilities
- Tools and equipment
- Energy and motivation, and
- Information.

Many of the tools you need are in other sections of this manual—"Administration," "Communications," "Labor Relations," "Motivation and Leadership," "Planning," "Scheduling," and "Short Interval Planning," among others.

NOTES

IDENTIFYING PRODUCTIVITY OPPORTUNITIES

The first step is to identify project operations and activities that offer opportunities for improvement. There are two rules of thumb here:

- It is easiest to implement improvements in operations that are already ahead of schedule and under budget, and
- It is easiest to identify areas for improvement in operations that are based on short cycles and small crews and involve a lot of repetitious tasks.

These two guidelines offer a starting point for selecting initial targets. The short interval planning process is also helpful here because it provides an ongoing structure for identifying short-cycle tasks, brainstorming approaches to current problems, implementing experimental solutions for brief periods, and quick evaluation of results.

Measuring Productivity

There are many techniques used for measuring productivity on job sites—time-and-motion studies, work sampling techniques, motion picture/videotape analyses, etc. The problem with many of these methods is that they require skilled observers and the data requires extensive mathematical analysis. Often the results are not available until long after the measured activities are completed. Just as often, the results are inaccurate because they do not differentiate between rework and original work or take learning curves into account. In almost all cases, the results are viewed with great suspicion by foremen and mechanics.

A better system is to get the job site foreman to report worker lost work time on a daily basis as a part of a Daily Time Report, which many contractors use as a means of reporting hours worked, or get the foreman to fill out a separate Foreman Delay Survey at the same time worked time is reported. The objective of any system you use is to report, on a daily basis, the loss of productive time by each worker and the reason for that lost time. Some advantages of the Foreman Delay Survey are that it:

- Is simple and straightforward
- Gathers data from the people who are most qualified to give it
- Gathers data daily on every worker on the job
- Reports the data in a way that is simple to analyze
- Takes the foreman only 5–10 minutes a day to complete
- Opens a new channel of communication between upper and lower management, and
- Is inexpensive.

Two sample forms are on the following pages as Figure 27-1 and Figure 27-2, respectively. You may want to use one of these forms or develop your own form depending upon what is best for your company.

Using daily reporting for each project gives the project team up-to-the-minute information it needs to identify activities and operations that are “bottlenecks” to overall productivity on the job. It also involves each foreman in identifying productivity opportunities, thereby making him aware of existing problems and encouraging his cooperation in suggesting and implementing changes.

A good system of reporting time lost by workers and why the time was lost is absolutely the best documentation you can have in justifying estimated costs for change orders and claims.

Seizing Opportunities

Once you’ve identified your opportunities, take advantage of them by putting the project team to work on exploring ways to take advantage of them. This involves a cooperative effort to:

- Acknowledge that opportunities exist
- Gather facts related to the opportunity
- Interpret the facts
- State the objective you want to accomplish

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- List your alternatives for accomplishing your objective
- Select the best alternative
- Develop and initiate a step-by-step plan of action, and
- Follow up to gather data and evaluate how successfully you took advantage of the opportunity.

Here again, the short interval planning process offers an ideal forum. It regularly brings together all the key players on the project team and provides short-cycle planning and evaluation.

Dealing with Resistance to Change

Improving productivity usually requires changing policies, procedures, or work methods. Naturally, this stirs resistance, especially among workers who are long accustomed to a particular way of working. Prefabrication and computers are good examples. Although both offer tremendous advantages, their introduction into the construction industry bred equally tremendous resistance. Even today, vestiges of that resistance remain.

To overcome worker resistance, the project manager must understand what fuels it. Primarily, there are five reasons that a person resists change:

- Rational opposition, a valid logical reason for believing that the proposed change is either unnecessary or will be ineffective
- Emotional reaction, an unfounded but deeply felt aversion to the change
- Selfish desires which conflict with the objective of the proposed change
- Insecurity (fear), the basis of most resistance to change, and
- Economic impact, a belief that the change will adversely influence his earnings or job security.

If the proposed change is clearly thought out, then the project manager can overcome resistance to change by:

- Deciding from the start what will and will not change
- Explaining to everyone involved why the planned changes are necessary
- Anticipating the most probable causes of resistance
- Planning a strategy to remove the most probable causes
- Providing necessary training to make everyone comfortable with the change
- Testing the change on a small scale before fully implementing it
- Encouraging worker comments, criticisms, and suggestions (feedback), and
- Being sensitive to feedback and using it to modify the change as necessary.

Keep in mind that people adopt new ideas all the time. The ideas they adopt tend to be those which they understand, which hold personal interest for them, and which enhance their lives in some way. These facts should be considered when designing or explaining any change aimed at improving productivity.

SPECIFIC STEPS FOR PRODUCTIVITY IMPROVEMENT

There are certain steps the project manager can take to improve productivity on almost any job. They include:

- Setting and maintaining the pace of the job
- Loading manpower properly, and
- Strengthening the job’s support system.

Set the Pace of the Job

Once work begins, the crews adjust to the job site, learning curves flatten out, and the job settles into a routine. The project manager can set and maintain this pace by:

- Establishing a schedule that is realistic but challenging
- Choosing policies and work methods that fit the job

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- Ensuring that the flow of necessary tools, construction equipment, materials, and equipment to be installed keeps pace with the schedule, and
- Monitoring job progress to identify and remove any obstacles which hinder maintaining the pace.

Keep these points in mind when reviewing the "Administration" (see Chapter 2), "Labor Reporting" (see Chapter 15), "Job Cost Control" (see Chapter 16), "Scheduling" (see Chapter 23), and "Purchasing" (see Chapter 28), sections of this manual.

Man the Job Properly

Undermanning or overmanning any stage of a project can throw off the pace of the job and the synchronization between the job site and the shop, warehouse, tool room, and purchasing agent. When too few men are on the job, the project slips behind schedule and deliveries of materials and equipment stack up. The effects of having too many men on the job are just as serious, although not as obvious. They include:

- Foremen and job supervisors spending time finding "busy work" for idle mechanics
- Idle workers trying to find ways to "look busy"
- Inaccurate or exaggerated data on labor reports
- Inappropriate unit rates that affect the forecast of the job outcome and the historical data the company uses to bid future jobs
- Pressure to trim overhead by reducing the job's support teams, and
- Stretching of resources on the job, resulting in overall limited availability.

The "Scheduling" section (see Chapter 23) of this manual for an explanation on how to assess your manpower requirements and balance them throughout the job. Central to this effort is the project manager's ability to recognize when labor adjustments are required and to take immediate action. The combination of an accurate labor reporting system and a responsive short interval planning process is the best tool for giving him that ability.

Strengthen the Support System

The job site is supported by a number of essential support groups within the company, particularly personnel responsible for:

- Safety program
- Tools and construction equipment
- Warehousing
- Prefabrication
- Personnel operations
- Engineering and planning
- Purchasing
- Accounting and payroll and
- Total Quality Management System.

The relationships both between the job site and each of these groups and among the groups themselves have a profound effect on project productivity. If communications are open and steady and if each group is committed to the project and feels confident that the other groups will each do their share, the entire project moves forward without hesitation. When one or more groups become bottlenecks, however, doubts arise and conflicts erupt. The flow of information and resources becomes erratic. Eventually, morale declines. Profits will soon follow.

To establish and strengthen the job site's support system, the project manager must establish a "team" identity among all the groups associated with the project. He must include each of them in the planning and implementation of policies and procedures, share information on job progress and problems, invite their feedback, and act on it. He must identify potential problems early and resolve them before they disrupt project operations. He must reinforce each group's efforts with recognition and rewards, and avoid giving any one group, even the field crews, all

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of the credit for any job done well or all of the blame for a job done unsatisfactorily. This is most effectively accomplished through leadership and organization.

CONCLUSION

Productivity and profitability are inseparable. Neither can be on the rise if the other is on the decline. Enhancing productivity is largely a matter of establishing procedures and work methods that fit the job and modifying them as necessary. It is also a matter of being sensitive to the fact that everyone on the project team—from the journeyman apprentice to the CEO—is a person who wants to do his job well and derives immense satisfaction from being on a team that does its job well.

FOREMAN DELAY SURVEY			
Date		**Name**	
No. in Crew		**Gen. Foreman**	
		Foreman Name	

Problems Causing Delays					
	Man-hours Lost				
	No. of Hours	X	No. of Men	=	Man-hours
Changes/Redoing Work (Design Error or Change)		X		=	
Changes/Redoing Work (Prefabrication Error)		X		=	
Changes/Redoing Work (Field Error or Damage)		X		=	
Waiting for Materials (Warehouse)		X		=	
Waiting for Materials (Vendor Furnished)		X		=	
Waiting for Tools		X		=	
Waiting for Construction Equipment		X		=	
Construction Equipment Breakdown		X		=	
Waiting for Information		X		=	
Waiting for Other Crews		X		=	
Waiting for Fellow Crew Members		X		=	
Unexplained or Unnecessary Move		X		=	
Other:		X		=	
		X		=	
Comments					

Figure 27-1 Sample Foreman Delay Survey Form

FOREMAN DELAY SURVEY EXAMPLE			
CRAFT:	*Pipe*	**DATE:**	*May 21, 1984*
FOREMAN/BADGE #	*Joe Smith #1234*	**# CREW PRESENT:**	*13*

	Man-hours Lost					
Problems Causing Delay	No. of Hours	x	No. of Men	=	Man-hours	Comments
1. Materials	*2*	x	*4*	=	*8*	*10" c/s pipe*
2. Tools		x		=		
3. Construction Equipment	*1*	x	*3*	=	*3*	*Waiting for picker*
4. Instructions		x		=		
5. Engineering		x		=		
6. Inspections	*1*	x	*6*	=	*6*	*Waiting for inspectors*
7. Access to work space		x		=		
8. Permits	*2* *1*	x x	*3* *4*	= =	*6* *4*	
9. Others (explain): *GAS LEAK*	*2*	x	*13*	=	*26*	*Leak in unit nearby*
		x		=		

Figure 27-2 Foreman Delay Survey Example

CHAPTER 28 PURCHASING

NOTES

PROFITABLE PURCHASING

Purchasing materials, equipment to be installed, and subcontracts usually incur expenses, and often appear to be directly opposed to profits. Any experienced project manager will tell you, however, that purchases can be a source of profit—if they are handled consistently and according to a set strategy.

The trick is to organize your purchasing strategy before you fill out your first purchase order. This strategy should provide for:

- The best possible expenditure of project funds
- Assignment of purchasing responsibilities
- Accurate and complete record keeping
- Timely delivery of materials and equipment to be installed, and
- Regular review of invoices to verify they are in accordance with purchase order commitments.

SPENDING WISELY

The project estimate gives you a budget for purchasing everything, or practically everything, you need to complete the project. Like any budget, however, it doesn't tell you what you have to spend. It only sets a limit on what you can spend and still realize a profit. By shopping shrewdly and avoiding costly errors, you can spend less than the budgeted amount for many items.

If you do the purchasing for your own projects, you should maintain a complete record of which suppliers and subcontractors offer the best prices and terms, are reliable, and are easy to work with. If your company has a purchasing department, someone in that department should be responsible for maintaining these files and the company's relationships with vendors. In either case, these records should be updated continually to give the company current information for making the most advantageous purchasing decisions in every situation.

Having the latest information on the best available prices and terms does not guarantee profitable purchases. Equally important is avoiding costly errors.

The most common errors occur in the preparation of purchase orders. To avoid these pitfalls, do the following:

- Use standardized purchase order forms. Whether generic or custom-designed by your company, standard purchase orders help eliminate oversights, omissions, and mistakes by getting everyone in the habit of submitting orders the same way every time.
- Prepare each order carefully. Be accurate in your description of each item and order at one time the full quantity of each item you need, thereby avoiding reorders and partial orders. This requires careful planning and close coordination of purchasing and scheduling.
- Give complete and clear instructions for shipment and delivery. Tailor your packaging requests to the type of material handling methods you will be using on the job.
- Assign someone the responsibility of double checking each and every purchase order before it is sent out. This responsibility includes not only checking the inherent accuracy of the order but also checking the items and quantities ordered against the project estimate and take-off. This precaution alone can save a company thousands of dollars annually.
- Follow up to make sure the purchase order is received, the information on it is clearly understood, and the delivery will be made on time.

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ASSIGNING RESPONSIBILITIES

Once the project team has identified what must be purchased, the most important step is to assign specific responsibilities for making sure each item is properly ordered, expedited, inspected upon delivery, and properly stored and handled.

In most companies, a purchasing agent oversees purchasing for projects. He gathers quotes on prices of equipment and materials, maintains current records on prices and availability of items, nurtures good working relationships with suppliers, and holds final authority for reviewing and approving purchase orders and approving purchases. In a company where there is no designated purchasing agent, these duties must be assigned to one or more specific individuals on the project team.

Expediting—making certain that ordered materials and equipment are delivered on time and in the manner required for efficient handling—is another major responsibility. Here again, some organizations have one person specifically assigned to expediting purchases for all of the company's projects. Other organizations leave this responsibility to be handled by someone assigned by the project manager. A sample Purchase Expediter, useful in communicating quickly and clearly with any supplier, is shown in Figure 28-1.

Out on the job site, someone must have the responsibility for inspecting purchased items as they are delivered, checking that quantities and types of items match what was ordered, making sure the items are in good condition, and reporting all receiving information to the project manager or the company office. The project manager usually assigns a foreman to either handle this responsibility himself or assign a reliable crewmember to do it. Either way, final responsibility for making sure incoming materials and equipment, are inspected ultimately lies with the project manager.

Few purchasing strategies are perfect. There are often times during a project when a foreman discovers that something was not ordered or that he needs an item not anticipated in the original take-off. Such situations can delay the entire construction process unless someone on the job site has the authority to make necessary purchases. Some companies hesitate to give this authority to superintendents or foremen, fearing that they will abuse the privilege. Others grant only limited purchasing authority—up to a few hundred dollars or so. The fact is, however, that if a company trusts a superintendent or job foreman with the supervision of hundreds of thousands of dollars of materials, equipment and labor, it should trust his judgement regarding necessary purchases. A lack of trust in this area is an indication of a much more serious problem.

THE IMPORTANCE OF KEEPING RECORDS

Paperwork is the only tool a project manager has to monitor and control his purchasing expenses and be sure that he receives what he orders. He can't rely on anyone's word or memory, there's simply too much at stake. To avoid errors, confusion, fraud, and other costly surprises, he must establish a strict method of record keeping for all project purchases. The basis of this record keeping system is the documents themselves. The most important of these is the purchase order.

The Purchase Order

A purchase order is not just an order form. It is a contract that binds the company to paying for delivered materials, equipment, or services. At the same time, it is a control document, used in the office to track the order and in the field to verify receipt of the proper items and quantities. It is also a set of instructions that tells the supplier not only what you want but how you want it packaged and shipped, and when you want it delivered. Finally, the purchase order is the basis for payment. See Figure 28-3 for a sample Purchase Order Form.

Because it plays so many roles in the purchasing system, the purchase order must contain complete and accurate information if the system is to work at all. Some of the information that should be on each purchase order is:

- A complete description of each item, including quantities and prices
- The company's job number, order number and other necessary control codes
- Plan and specification references

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- Specific delivery date(s)
- Packaging and shipping specifications according to the materials handling requirements of the job
- Requirements for notification of delivery, and
- A list of documents needed from the supplier, including submittals, certificates, invoices, delivery and packing slips, warranty information, and operation and maintenance manuals.

The Supplier's Acknowledgment

Another important document in the purchasing process is the supplier's written acknowledgment that he received the purchase order and does or does not accept the terms (prices, delivery dates, shipping methods, packaging requirements, documentation requirements, warranty periods, etc.) it contains. This acknowledgment binds the supplier to the terms of the purchase order. Therefore, the project manager should insist that every supplier he deals with reply to each purchase order with an acknowledgment, and that each acknowledgment specifically states:

- The terms agreed to, and
- Any modifications to the original purchase order.

Some suppliers consistently refuse to accept various terms of contractor purchase orders. One proven way to eliminate the time-consuming process of negotiating purchase order terms for each job is to negotiate, one time only, a standard modification for each vendor. This is far preferable to accepting the terms contained in a vendor's acknowledgments.

Bills of Lading, Packing Lists and Suppliers' Invoices

When a shipment arrives, the person charged with inspecting deliveries should immediately check the contents of the delivery against the carrier's bill of lading and the packing list. He should note any discrepancies—missing items, incorrect quantities, back orders—on the appropriate report form and immediately send the report to the project manager or the company office. When the supplier's invoice arrives, it should be checked item-by-item against the bill of lading, packing list and field report regarding the delivery, and any discrepancies resolved immediately.

Purchasing Control Sheets

A fourth essential purchasing document is a set of purchasing control sheets. Based on the project take-off, these three documents list, respectively, every material, piece of installed equipment, and subcontract needed for the project and provides spaces for tracking its status in the purchasing system.

See Chapter 25 for sample control sheets for equipment and subcontracts. Where applicable, they include descriptive and quantity information on each item, submittal information, purchase order numbers and dates, delivery dates, whether or not all necessary documents were received with the order, and other pertinent data. Maintaining sheets like these allows the project manager to see at a glance where any ordered item is in the purchasing pipeline and to spot well ahead of time any potential late deliveries or other problems that might cause delays.

Purchasing Cost Control Reports

Just as the project take-off provides a basis for preparing orders, so too it gives the project a built-in structure for monitoring purchasing costs. Using the take-off list of items and services to be purchased, the company's accounting department can issue regular purchasing cost control reports. The purpose of these reports is to let the project manager know where project expenditures stand in relation to the project estimate. (see Figure 28-2).

The report should be generated at least monthly and include:

- A list of all the project's purchase commitments (purchase orders and other contracts) made to date, and their total dollar value

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- The original estimated cost of the materials, equipment and services committed to
- A list of ordered items and services received
- A list of the invoices on which payment has been made, and their dollar amounts
- A list of invoices received but not yet paid, and their dollar amounts, and
- A projection of total project purchasing costs and a comparison of this amount with the original estimated purchasing costs.

With the information contained in this report, the project manager can monitor the success of his purchasing strategy and modify the strategy far enough ahead of time to avoid overrunning the project estimate. As with all project related information, proper filing of this report and its associated material is critical.

CONCLUSION

Equipment, materials, and subcontracts are a major expense on most construction projects and deserve special attention. Fortunately, they are relatively fixed expenses, and controlling them effectively is largely a matter of designing an effective purchasing strategy, strictly following it, and monitoring it through careful record keeping.

PURCHASE EXPEDITER

TO

DATE

PLEASE REPLY IMMEDIATELY

☐ By Phone

☐ By Fax

☐ On This Form

PLEASE SAVE YOUR TIME AND OURS BY COMPLETING THIS FORM RATHER THAN WRITING A LETTER. FORM MAY BE RETURNED IN A #10 WINDOW ENVELOPE. FOLD AS INDICATED AT UPPER LEFT

Sub Purchase Order Number	Your Invoice Number	Your Order Number	Invoice Date	Invoice Amount	Reference

ORDER INFORMATION

1. ☐ Please rush PRICES.
2. ☐ Acknowledge our order and give SHIPPING DATE.
3. ☐ Please mail ACCEPTANCE COPY of our Purchase Order.
4. ☐ Is this order considered COMPLETE?
5. ☐ Please inform us about items BACK ORDERED.
6. ☐ CHANGE made on above order. Please acknowledge.

SHIPPING INFORMATION

7. ☐ RUSH shipment. ADVISE earliest shipping date.
8. ☐ Will you SHIP on date requested?
9. ☐ WHY did you not ship as promised? WHEN will you ship?
10. ☐ IF SHIPPED advice method.
11. ☐ What PARTIAL shipment can you make and WHEN?
12. ☐ When can BALANCE of order be shipped?
13. ☐ Please make certain order is SHIPPED VIA _____
14. ☐ Please make SHIPMENT RELEASES as shown under Remarks.

ACCOUNTING INFORMATION

15. ☐ We require _____ INVOICE COPIES.
16. ☐ INVOICE enclosed RECEIVED IN ERROR.
17. ☐ We are RETURNING attached invoices.
18. ☐ PURCHASE ORDER NO. Incorrect or missing.
19. ☐ PRICE TERMS DISCOUNT Do not agree with quotation.
20. ☐ Please forward CORRECTED INVOICE or CREDIT MEMO for following reason: (circle one)
    Quantity incorrect. Extension incorrect.
    Should be FOB destination. Unit price incorrect.
    Material wrong or Defective.
21. ☐ SALES TAX not applied. Exemption No. is: _____
22. ☐ We have no record of RECEIVING INVOICE NO. _____ shown on your statement. Please send duplicate invoice.

SERVICE AND OTHER INFORMATION

23. ☐ If order has been shipped, MAIL INVOICE today.
24. ☐ Please forward CERTIFIED WEIGHT slip.
25. ☐ Please forward SHIPPING NOTICE.
26. ☐ Please show PURCHASE ORDER NUMBER on papers referred to or attached.
27. ☐ Material not received. TRACE AND ADVISE.
28. ☐ Please forward receipted FREIGHT BILL.
29. ☐ We have NO RECORD of transaction covered by your invoice. Advise date of shipment, name of person placing order and furnish signed delivery receipt.
30. ☐ Please complete and return our REQUEST FOR QUOTATION dated _____.

SIGNED _____

REPLY

DATE	SIGNED

Figure 28-1 Purchase Expediter

PURCHASE ORDER REGISTER

P.O. Number	Cost Center	C.O. No.	Material	Vendor	P.O. Amount	Estimated Amount	Difference	Reason

Figure 28-2 Sample Purchase Order Registry Request

Allaince Contracting
123 Ave
Anywhere, VA 22220
Phone & Fax

PURCHASE ORDER:
P.O. NO./JOB NO./C.C.

DATE: ____________________
TERMS: ____________________
____
SHIP VIA: ____________________

TO: ____________________
____
____
____

SHIP TO: ____________________
____
____
____

DELIVERY REQ'TS: ____________________

ATTN: ____________ PH: ____________ ____________________

ITEM	QUANTITY	UNIT	DESCRIPTION	PRICE	PER	EXTENSION
			REF:			
				TOTAL		**$0.00**

PURCHASE ORDER: **0**
P.O. NO./JOB NO./C.C.

CONFIRMING
X ORIGINAL ORDER
Resale No. C278-30668

____
AUTHORIZED BY
Project Manager

SHT _1_ OF ___

SEE ATTACHMENT FOR STANDARD CONDITIONS OF PURCHASE * WE ARE AN EQUAL OPPORTUNITY EMPLOYER

Figure 28-3 Sample Purchase Order (Sheet 1 of 3)

ALLIANCE CONTRACTING

Vendor**:**
P.O. No.:
Date:

STANDARD PURCHASE ORDER NOTES

1. This order is made subject to the terms and conditions contained in Attachment No.(s) ___ and ___.

2. Plans, specifications and addenda are available for your use, at the office of Alliance Contracting - 144 Tackle Ave. So. - Anytown, NY - 99000.

3. Time is of the essence for this project. Vendor shall commence and prosecute the work specified in this purchase agreement in a prompt and diligent manner and furnish materials in sufficient time to enable the purchaser to perform and complete his work within the projects scheduled time frame. Advise in writing, immediately, of any delays or problems of any nature that may affect timely completion.

4. All communications regarding this project shall be through the office of Alliance Contracting. No direct communications shall be by the Vendor or his Agent to the Engineer/Owner without prior approval of Alliance Contracting. In the event that Alliance Contracting approves direct communication between the Vendor or Agent and the Engineer/ Owner, the Vendor or Agent shall advise Alliance Contracting, in writing, within five (5) calendar days as to the exact nature and disposition of such communication.

5. Make no shipments against this order without coordinating delivery requirements with Alliance Contracting.

6. Fixture Data sheet numbers ___ through ___ are attached to provide specific requirements and information for the lighting fixtures on this order.

7. Gear Data sheet numbers ___ through ___ are attached to provide specific requirements and information for the distribution equipment on this order.

8. **DO NOT** make any "package express" shipments to the jobsite. Should the Vendor or his Agent elect to make "package express" shipments to the jobsite, they do so at their own risk. Should any materials shipped by "package express" be received at the jobsite by other than Alliance Contracting employees, the Vendor shall be responsible for locating and /or replacing such material(s) in a timely manner.

9. Invoices against this order will not be paid until receipt of the signed confirmation copy of the order from the vendor.

10. Invoice for final payment shall not be paid by Alliance Contracting unless accompanied by a letter of completion stating that the materials and/or services furnished against this order are one hundred percent complete.

Figure 28-1 Sample Purchase Order (Sheet 2 of 3)

ALLIANCE CONTRACTING

Vendor:
P.O. No.:
Date:

ATTACHMENT NUMBER 1

1. Vendor agrees to supply this material in strict accordance with the plans and specifications.

2. Submit to this office ___ copies of descriptive literature, shop drawings and samples, as required, not later than _____.

3. Submit to this office __ copies of O&M manuals in strict accordance with the contract documents at time of shipment, unless otherwise specified.

4. This order is subject to approval of your submittals; please make no shipments nor incur any charges against this order until you are advised in writing that you may proceed.

5. Approval of shop drawings, samples or submittals shall not relieve the seller of responsibility for any deviation from the requirements of the contract documents unless seller has informed Alliance Contracting in writing of such deviation at the time of submission, nor shall approval relieve the seller from responsibility for errors or omissions in the shop drawings, samples or submittals.

6. Please advise in writing, the scheduled shipping dates or any deviation from dates shown on the purchase order.

7. This purchase order number must appear on all containers, packing lists, invoices, bills of lading, etc.

8. All materials furnished against this order shall be "labeled" or "listed" as suitable for the use intended.

9. No jobsite deliveries will be accepted after 2 P.M. unless otherwise agreed to by Alliance Contracting.

10. All deliveries requiring lifting or hoisting shall be scheduled 48 hours in advance, NO EXCEPTION.

Materials and equipment shall be delivered COMPLETELY assembled unless otherwise noted by Alliance Contracting. Costs incurred by Alliance Contracting for assembly of items not complying to this requirement shall be at the expense of the vendor.

Figure 28-1 Sample Purchase Order (Sheet 3 of 3)

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MATERIAL HANDLING AND PRODUCTIVITY

Industry studies repeatedly show that nothing increases job site productivity as dramatically as good material handling. By properly planning and coordinating material deliveries and movements, a field crew can spend significantly fewer hours moving material and significantly more hours installing it.

Material handling is also a key factor in job safety. As many as 70 percent of construction injuries result from unsafe material handling procedures. Consequently, good material handling techniques can greatly improve your company's safety record.

A PRACTICAL STRATEGY

Efficient material handling begins with a strategy that everyone understands and follows. The basis of this strategy should be the company's written procedures and routine practices. However, because each job is unique, the project manager should devote sufficient pre-planning time to designing specialized procedures that match the physical layout of the job site and the nature of the job.

In designing a material handling strategy, the project manager should:

- Inspect the material handling situation at the job site before construction begins
- Establish and enforce efficient material handling practices from the first day of the job
- Whenever possible, assign one person the task of overseeing material handling
- Coordinate the efforts of the company's purchasing department, fabrication shop, and warehouse with those of the field to ensure that the material handling plan is followed strictly and uniformly at all levels
- Insist that the job supervisor be informed about all scheduled deliveries in time to prepare the job site properly
- Teach material handling techniques to everyone in the shop, the warehouse, and the field and coach them in their use
- Insist that any materials not needed on the project be identified and returned to the supplier or the company warehouse as soon as possible in order to keep the job site uncluttered, minimize deterioration of the material, and either recover the company's investment in the material more quickly or make the material available to other projects
- Be receptive to suggestions and new ideas, and
- Use every opportunity to improve material handling techniques on the job.

Because so many people are involved in material handling, communication and training play a large role. At the same time, a large number of people means a large pool of ideas for improving material handling procedures. Regularly dipping into this pool for suggestions and opinions is one of the best and least expensive ways to improve job site productivity.

THE JOB SITE INSPECTION

You can not know what material handling instructions to give the project team or what packaging and shipping instructions to give your suppliers until you have gone to the job site and conducted a thorough inspection of the material handling equipment and facilities that are available to you. You should conduct this inspection along with your job supervisor, since he is the one with the immediate responsibility for on-site material handling operations.

Figure 29-1 is a Material Handling Checklist that includes many points to be considered in designing such a plan. Use it as a guide in conducting your inspection.

Following your inspection, meet with all the members of your project team to:

- Review the inspection results

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- Discuss existing and potential problems and identify material handling equipment and facilities that you need but which are not available at the site
- Review all sections of the contract documents that specify your material handling responsibilities and those of the project owner or general contractor, and
- Make a complete list of your concerns and your recommendations for resolving them.

THE MATERIAL HANDLING CONFERENCE

Meet with the general contractor or the project owner to discuss the results of your inspection and your team meeting. Explain your requirements and concerns and present your recommendations. Be sure that the general contractor or project owner clearly understands that efficient material handling is important to the productivity and the safety of the entire job, not just your part in it.

Work out a satisfactory plan for modifying existing equipment or facilities or providing additional ones. Set deadlines for the completion of the plan. After the meeting, send the project owner or general contractor a brief letter outlining what you discussed at the meeting and what plans you agreed upon.

PURCHASING TECHNIQUES THAT IMPROVE MATERIAL HANDLING

Material handling begins with the completion of the purchase order. The packaging and shipping instructions stated on the purchase order directly affect how easily the ordered items can be unloaded and moved around at the job site. Consequently, the project team must understand the purchasing and material release system and use it to enhance the material handling effort.

Specifically, purchasing should be organized so that equipment and materials:

- Arrive at the job when they are needed
- Arrive when a permanent storage area is available, avoiding the need to move them later to another storage location before final installation, and
- Are packaged for most efficient handling and no loose materials are delivered to the job.

To make sure that the supplier delivers all materials exactly as needed, all purchase orders or material release requests must specify the following information:

- Type of container required
- Number of items per container
- Type of protection needed
- Required packaging
- Required mode of transportation
- Job identification and destination data, and
- Specific delivery date(s).

PREFABRICATION AND MATERIAL HANDLING

Prefabrication is a tremendous tool for increasing productivity, but loses its advantages if the time saved by fabricating in the shop is wasted in handling the assemblies in the field. To avoid this, the project team should make sure that all prefabricated assemblies:

- Arrive at the job when the job site is ready for them to avoid the need for storage
- Are crated, palletized, bundled, or otherwise packaged for most efficient handling, and
- Are tagged, color-coded, or both to allow job site crews to know at a glance where a particular assembly should be installed.

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Some items demand special attention, and should be delivered to the job as part of a unit or, if the fab shop is on-site, incorporated into the unit. This reduces field labor and provides higher quality, when the work is done in the better controlled conditions of a shop.

See Chapter 30 for more information on handling materials in the fabrication process.

CONCLUSION

The central idea of material handling is to work smarter not harder. To do this requires your commitment, your planning and your leadership in coordinating an effective system at all project levels. It also demands exceptional communications and cooperation between your project team and the project owner, the general contractor and the other trades on the job.

MATERIAL HANDLING CHECK LIST			
Use this checklist to assess the material handling situation at the job site.			
Project Name		Project Number	
Access			
	There is clear access to all unloading points.		
	Company's and supplier's trucks get in and out of the site by (describe route)		
Provisions for Unloading Trucks			
	Truck level loading docks are provided		
	Unloading areas are located to ensure minimum handling of materials in order to get them into the construction area		
	The general contractor has a system whereby materials and equipment can be moved directly into the building and **not** have to be stored outdoors		
Man and Materials Hoists			
	Hoist locations are		
		Capacity	
		Capacity	
		Capacity	
	Truck-level unloading dock is equipped with hoist		
	There is ready access to all hoists		
	Exceptions		
	Date hoists will be ready for use		
	Date hoists will be dismantled		
	The general contractor has a scheduling system for use of the hoist, especially for incoming trucks		

Figure 29-1 Material Handling Checklist (Sheet 1 of 2)

Tower Crane				
	Tower Crane location			
	Capacity: Full Extension			
	Half Extension			
	Quarter Extension			
	There is ready access to the tower crane			
	Exceptions			
	Date crane will be ready for use			
	Date crane will be dismantled			
	The general contractor has a scheduling system for use of the crane, especially for incoming trucks			
Horizontal Movement of Materials				
	There are areas where building design makes horizontal movement difficult and items like ramps might be needed			
	Area		Needed	
	Area		Needed	
	The general contractor has a system that allows us to have certain work areas to ourselves for certain periods of time			
	The general contractor has a policy/system controlling or prohibiting storage of materials on floors, to prevent obstructions to material movement			
Vertical Movement of Materials				
	There are areas where getting men and materials up to an installation point may be a problem			
	Location		Problem	
	Location		Problem	
	Location		Problem	
Housekeeping				
	The general contractor has a system for removal of trash and other obstructions.			

Figure 29-1 Material Handling Checklist (Sheet 2 of 2)

CHAPTER 30 PREFABRICATION

NOTES

WHY PREFABRICATION?

Prefabrication—the construction method in which assemblies are designed and built in the shop for installation in the field—is one of the project manager's most effective tools for increasing productivity and job profits. Some examples of shop fabrication applications (either off-site or on-site) would be sheet metal (ducts) and piping configurations. Among the many advantages of prefabrication:

- Work is done under close supervision and at the same location as the detailers
- On-site installation crews can be kept smaller
- On-site quality control is easier because the fab work is done under controlled conditions and by skilled personnel
- Properly planned and detailed prefabrication makes material purchasing more accurate, reducing the number of shorts and returns
- Assemblies can be delivered to the job site as needed, minimizing on-site storage requirements
- Assemblies are not as attractive to thieves as materials are
- Regular employment in the fab shop promotes company loyalty and provides fill-in work for job site crews when weather prevents work on-site
- Because of the controlled environment and their specializing in fab work, shop employees quickly become skilled, innovative and very productive
- The work can be done when weather conditions are not ideal
- Fab shops offer many more opportunities for using power tools (fork lifts, electric hoists, etc.) than the job site does
- The company's specialized power equipment can be concentrated in one spot, eliminating the need for a full complement of expensive power tools on every job site
- Custom fabricated jigs can be improvised in the shop with minimal cost
- The planning required for prefabrication makes coordination of efforts with other trades much easier, and
- Depending upon your local labor agreement, metal tradesmen or helpers may be able to work in the fab shop, thereby trimming costs.

PRODUCTIONIZING THE PROJECT

Prefabrication brings to the construction industry the same type of production techniques that are used in practically all other industries. With prefabrication come many cost and timesaving advantages, but realizing these advantages requires planning and following through.

The simple strategy of prefabrication is:

- Fabricate/assemble in the shop;
- Erect/install in the field.

The process of prefabrication has many features that help make that strategy effective:

- Repetitive operations
- Efficient work area arrangement in the shop
- Progressive "station-to-station" (assembly line) fabrication of components, and
- The capacity to produce subassemblies as well as components.

PLANNING FOR PREFABRICATION

Planning for prefabrication demands good organization and careful attention to scheduling and material handling. The project manager's first step is to organize the prefabrication team so that

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he can identify opportunities for prefabrication in the project and assign specific responsibilities for exploiting those opportunities.

Among the project team members who should be involved in both the planning and the implementation of prefabrication are:

- Project manager
- Shop foreman
- Job foreman
- Draftsman/designer
- Field superintendent, and
- Purchasing agent.

Other members of the team may be added as needed.

Once the team is assembled, planning is done in three stages:

- Review project plans for situations where prefabrication will reduce double-handling of materials in the field, minimize on-site storage requirements, speed field installation, or increase overall productivity
- Use the job breakdown and the overall project schedule to schedule prefabrication design and production with sufficient lead time, and
- Assign each member of the team specific responsibilities, being certain to cover items such as:
  - Who determines what to draw?
  - Who approves drawings before production can begin?
  - Who coordinates purchasing of materials with the production schedule?
  - Who coordinates deliveries between the shop and the field?

A Job Fabrication and Drawing Requirements Form such as the one in Figure 30-1 is useful for tracking prefabrication activities and anticipating potential delays or problems before they occur.

GENERAL CONSIDERATIONS

Designing and producing prefabricated assemblies is only half of the prefabrication requirements. You also have to adjust job site procedures and the thinking of the entire project team to get the most of your prefabrication program. Among the necessary steps to take are:

- Be innovative in your approach to prefabrication, keeping an eye out for a better, quicker, and less expensive way to get the job done
- Be receptive to suggestions from the project team
- Have your job supervisors insist on detailed drawings of all assemblies to be prefabricated
- Make sure field craftsman know exactly what is expected of them regarding method and technique
- Avoid assuming that a prefab job is being done as originally planned
- Coordinate deliveries of prefabricated components with job tasks and the availability of on-site storage space
- Plan the job site for efficient receiving, storage, and distribution of prefabricated materials, and
- Provide a secure area for storage of prefab components.

A PRECAUTION

Among experienced project managers, few nightmares equal that of carefully designing and fabricating a few hundred assemblies only to have the general contractor or the owner's architect change the plans at the last minute, turning weeks of work into an expensive pile of scrap. To avoid such a situation, be sure to have the general contractor or the owner's project

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authority sign off on your prefabrication drawings before you start production. This way, if he later makes a change that affects the prefabricated work, you have in hand a signed document that makes him responsible for the cost of modifying already-manufactured assemblies.

CONCLUSION

Despite pockets of resistance, prefabrication continues to gain ground as the wave of the future in the construction industry. Its effects on productivity and profits are substantial, and project teams who master it aggressively embrace it. Without doubt, prefabrication is the best example of working smarter instead of harder to increase both quality and profitability. However, each prefabrication activity should be analyzed from a cost standpoint to be sure that it would be cost effective.

PRE-PLANNING MEETING – JOB FABRICATION & DRAWING REQUIREMENTS

Date	Job Name_____
Attendees	Job # _____

A. CONTRACT DRAWINGS

CHECK	ITEM	COMMENTS	
	Complete Plans & Specs received		Number of Copies
	Two complete sets turned over to Job Superintendent		Date
	Shop Drawings procedure reviewed		Approval copies required
	Shop Drawings retained in office		Number required
	Shop Drawings retained at job site		Number required
	Bid set drawings turned over to Project Manager		Date
	Operation/Maintenance Manuals required		Number required

B. FABRICATION DRAWINGS

Item No	Contr Dwg No	Prefab Dwg No	Req'd Dwg Date	Req'd Fab Date	Req'd Job Del Date	Materials Used & Comments

Figure 30-1 Sample Job Fabrication and Drawing Requirements Form

CHAPTER 31 RECEIVING AND STORAGE

NOTES

THE JOB OF RECEIVING AND STORAGE

Receiving and storage operations are too often considered a minor part of the project and given little attention. As a result, shipping errors remain undetected until too late, improperly stored equipment deteriorates, parts and instructions are misplaced, and everything is moved several before reaching its installed location.

Avoiding these problems requires only a simple receiving and storage procedure and a few minutes of planning and inspection each day. Like other procedures, it must be followed carefully to be of any value.

THE ROLE OF THE JOB SUPERVISOR

The project manager can not always be around when every delivery arrives, nor should he be. It is not his job to personally inspect incoming materials and equipment, verify their condition and quantities, and move and store them properly. It is the job of the field supervisor or the person the field supervisor assigns to the task.

However, it is the project manager's responsibility to make sure that the job supervisor understands the importance of strict receiving and storage procedures, assigns a responsible individual to the job, and monitors that individual's performance constantly.

THE PROJECT MANAGER'S ROLE

To support the job supervisor's efforts regarding receiving and storage, the project manager should provide him with:

- A copy of the company's receiving and storage procedures
- A copy of the project schedule
- A written record of what deliveries are expected and when they are scheduled to arrive
- Written updates of the delivery schedule, as required, and
- Folders for filing bills of lading, manufacturers' instructions, and other documents related to incoming shipments.

RECEIVING

The procedures for efficient receiving are simple but demand careful attention to detail and close coordination of field, office and shop.

General Procedures

- Know the company's policies for purchasing and requisition (see Chapter 28) and material handling (see Chapter 29)
- Establish adequate receiving and storage facilities at the job site (see Chapter 11)
- Whenever possible, assign one person on the job to be responsible for all receiving and train that person in following the company's procedures
- Know what is arriving before it arrives by maintaining good communication with the office and the shop
- Make sure each purchase order specifies the type, number, and approximate weight of the pieces ordered, the date of shipment, the type of packaging, and the mode of shipment, and
- Not accept or allow anyone on the job to accept a shipment without thoroughly checking it.

Inspection Procedures

- Carefully inspect each shipment at the time it arrives

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- Check each item against the purchase order and the packing slip and note any discrepancies on the packing slip and the bill of lading, and
- Inspect each item for damage and do not discard any damaged material or outer packaging.

Documentation Procedures

- Note all damage on the bill of lading before signing it
- Even if a shipment arrives in apparently good condition, protect yourself and your company by writing on the bill of lading, "Received in apparently good condition. Contents to be checked at a later time." Consider having a rubber stamp made for this purpose.
- Have the delivering driver sign the bill of lading
- Note on the Daily Job Log form all discrepancies between delivered materials or equipment and the purchase order (see Chapter 24)
- Note on the Daily Job Log form any discrepancies between the packaging and shipping information on the purchase order and the actual packaging and mode of shipment of the delivery, and
- Submit all packing slips to the company office along with each week's time sheets.

Notification Procedures

- Advise the project manager immediately of any discrepancies between the purchase order and the types or number of pieces received
- Report all damage immediately to the project manager, providing details about the type and extent of the damage, and
- If concealed damage is discovered after the trucker has left the job site, notify the project manager immediately and note the damage on your Daily Job Log.

Accepting Damaged Shipments

When the job supervisor or his assignee signs the bill of lading, he is accepting the shipment. In cases where the material or equipment received is needed immediately, he may have no choice but to accept the damaged shipment and do the repairs himself. If damage is extensive, however, refusing the shipment might be the best course to follow.

In all cases, the job supervisor should get the project manager's opinion as to what to do, since it is the project manager's responsibility to initiate claims against the shipper through the company's purchasing department.

UNLOADING AND STORAGE

Regarding unloading and storage, the job supervisor or his assignee must be sure to:

- Arrange for all necessary material handling equipment (hoists, crane, forklift, pallet movers) to be available when each shipment arrives
- Unload material and equipment at a convenient location that will eliminate double-handling of the shipment, preferably directly into the building or to the installation site
- Remove the manufacturer's installation instructions from each item and file them where they can be located easily at installation time
- Arrange indoor storage of critical equipment
- Protect equipment stored outdoors from weather and ground water, and
- Follow the manufacturer's written recommendations on storage, protection, lubrication, and rotation of moving parts.

CONCLUSION

Conscientious receiving and storage of all deliveries are the first steps toward efficient installation. They insure that the right materials and equipment are on hand and in good condition when needed, thereby contributing to productivity and eliminating unnecessary delays.

CHAPTER 32 TESTING AND TEST REPORTS

NOTES

THE IMPORTANCE OF TESTS AND TEST REPORTS

Test results are the proof of job quality. For the project to be considered finished, all systems and components must perform as specified in the contract documents. However, it is not enough for the systems and components to pass their various tests; the test results must be accurately recorded as proof of satisfactory job completion. Consequently, test reports are important job documents and may be needed by your company to defend itself if questions arise or a claim is filed at a later date.

TYPES OF TESTS

Depending on the type and size of the project, any of the following tests may be required:

- Pressure testing
  - Piping system
  - Air system
- Operation and quality control testing
  - General equipment performance tests
  - Control systems
  - Hydro tests
  - Chlorination tests
  - Phasing motor rotation
  - Continuity
  - Grounding
  - Certification test for domestic water
- Code testing
  - In-plant
  - Local and state government
  - Municipal
  - Testing agency (Underwriters Laboratories, etc.)
  - Insurance companies
- Permit testing
- Pre-start-up testing, and
- Fire-suppression testing
- Fire alarm testing

Other tests may be required for specific types of projects or projects in particular areas of the country.

TESTING RESPONSIBILITIES

The project manager should assign specific responsibilities for testing to one or more individuals on the project team and give them specific instructions regarding the procedures involved. Among the most important responsibilities are:

- Being certain all test procedures specify:
  - Method for conducting tests
  - Target results
  - Acceptable tolerance ranges
  - Preparations for retesting, and
  - Types of test documentation required.
- Preparing all systems and components for testing and notifying the project manager when preparations are complete.
- Notifying all persons required by the contract documents to witness each test, including (as appropriate):

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- Project architect
- Project engineer
- General contractor or representative
- Owner's representative
- State, local, and municipal authorities
- Local fire marshal, and
- Local plumbing inspector.

- Properly documenting all test results.

TEST DOCUMENTATION

It is vital to properly and accurately record all test results. The procedure to be followed should include:

- Using report forms that are acceptable to all parties (see Figure 32-1, Figure 32-2, and Figure 32-3 for Standard Test Record Forms)
- Completing all applicable sections of the form ahead of time (including project name, number and location, the test date, and the details of the test methods to be used)
- Verifying that all results are accurate as recorded
- Having everyone who is required to witness the test sign the test form, and
- Transmitting copies of all test results to the customer and the company office.

CONCLUSION

There is nothing difficult about the testing procedure. If quality control standards have been maintained throughout the installation process and the system is prepared properly prior to testing, satisfactory test results are almost assured. If the results are accurately documented, the results will stand as valid evidence that your company has fulfilled its responsibilities.

STANDARD TESTING RECORD FORM					
Project Name			Project Number		
Project Location					
Test Date			Temperature		
Pipe Line/Service Tested					
Name					
Location/Description					
Piping & Materials					
Operating Pressure Specification Test Pressure					
Testing Method					
Method of Testing					
Instrument Used					
Actual Test Pressure					
Testing Results					
Time Test Started			Pressure		
Time Test Completed			Pressure		
Duration of Test		Pressure Rise		Drop	
Signatures					
Witness			Representing:		
Witness			Representing		
Witness			Representing		
Remarks					

Job Supervisor's Signature

Figure 32-1 Sample Standard Test Record Form

GROUND RESISTANCE FIELD TEST DATA

PROJECT _____

DATE _____

MAKE & MODEL OF INSTRUMENT USED _____

TYPE OF TEST PERFORMED _____

DESCRIPTION OF ITEM, SYSTEM OR PART OF SYSTEM TESTED	TEST RESULTS	TESTED BY	APPROVED BY	REMARKS

Figure 32-2 Sample Test Form

MOTOR CURRENT TEST READINGS

PROJECT _____

TEST EQUIPMENT

MANUFACTURER _____

RATING _____

TYPE _____

EQUIPMENT IDENTIFICATION	NAMEPLATE INFORMATION					ROTATION CHECKED	ACTUAL FLA			OVERLOAD HEATER			FUSE SIZE	DATE TESTED	TESTED BY	WITNESS BY
	HP	RPM	PH	VOLTS	AMP		A	B	C	SRC FACTIR	MFR	CAT NO.				

Figure 32-3 Sample Test Form

CHAPTER 33 TOOLS

NOTES

TOOLS AND THE TRADE

Tools are the journeyman's means of earning a living. A good journeyman realizes that good tools, when properly used and cared for, make his job easier and safer, and he understands that it is his privilege to have good tools available when he needs them. At the same time, the company knows that providing the right tools improves worker productivity. Unfortunately, the price of providing tools has become very steep.

Theft, loss, and vandalism of tools is an expensive problem in the contracting industry, accounting as high as 4 percent of the labor cost on some projects. Misuse of tools accounts for additional costs in injuries and lost time. With tight market conditions and increasing competition forcing the contractor to trim his bids to the bone to get work, there is often not enough cushion in a job estimate to absorb these losses. As a result, tool expenses cut into the profits necessary to keep the company afloat and employ the very people who are carelessly damaging, losing, abusing or outright stealing company tools.

THE PROJECT MANAGER'S RESPONSIBILITIES

The project manager has four specific responsibilities regarding tools:

- Anticipate what company-supplied tools are needed for each stage of the project and have them available when needed
- Assign an individual the responsibility of enforcing all company policies and procedures regarding tools on the job site and keeping complete and accurate records of tool use
- Monitor the tool control system on the project to make sure it is functioning properly, and
- Develop and maintain a preventive maintenance schedule for all tools assigned to the project, and document all tool maintenance actions.

A TOOL CONTROL STRATEGY

This industry-wide situation puts an added burden on the project manager, who is responsible for protecting the company's assets. To make this burden bearable, the project team must establish and enforce strict tool control procedures aimed at:

- Minimizing loss, damage, and theft of tools, and
- Ensuring job efficiency and safety.

There are three parts in a good tool control strategy:

- Physical control of company tools
- An accounting system for tracking tool use, and
- Employee training in proper use of tools.

All of them begin with the project manager or the job supervisor assigning one person to manage the system and enforce the company's policies and procedures. On a large job involving several crews, this person might have no other responsibility beside tool control. On a smaller job, the job supervisor or crew foreman might have this responsibility in addition to his other duties.

Regardless of who is in charge of job site tool control, he must understand and rigidly enforce the rules, with no exceptions.

NOTES

PHYSICAL CONTROL

Physical control involves two simple but essential steps:

- Permanently marking each company tool with the company's name, and
- Providing secure storage for all tools when not in use.

These steps are particularly important for expensive power tools such as skill saws and pneumatic wrenches, but they are just as applicable to hand tools that the company issues to its mechanics.

Marking

Etching or stamping is the best way to mark tools permanently. Painting colored stripes or the company's name on each tool is also a good practice, since it makes identification easier. But paint by itself is insufficient; it can be removed too easily.

Mark all tools in the same place—on the left side of the handle, for example. Uniformity makes identification simpler and makes any attempt to eradicate the marking very obvious. Power tools and construction equipment should be marked in more than one place—one obvious, the other hidden. The hidden marking, particularly if it includes a company control code, can prove invaluable to identifying a tool if it is stolen.

Storage

The company must provide secure storage for all its tools. For centralized storage, a tool shed or trailer with a security alarm is the best answer. For security during work hours, locked gang boxes are a good choice, provided there is control over the number of keys issued and the people they are issued to. If a gang box is provided for each crew, only the crew foreman, the job supervisor, and the person assigned to job site tool control should have a key for it.

Encourage each journeyman to maintain his own tool box for storage of his personal tools and those assigned him by the company. Warn him to keep it locked when it's out of sight.

AN ACCOUNTING SYSTEM

A tool accounting system involves four things:

- Knowing what tools are on the job site
- Knowing where each tool is and who is responsible for it
- Inspecting each tool regularly and returning worn or damaged tools to the warehouse for replacement or repair, and
- Returning to the warehouse or shop all tools no longer needed on the job.

Record Keeping

The basis of the system lies in having one person on the job responsible for maintaining:

- A complete inventory listing all tools issued to the job
- Tool Control Sheets used to track tools issued to crews and individual mechanics
- An up-to-date preventive maintenance schedule
- Documentation of employee training and use of all tools
- Records of tool repair requests and results of tool repairs, and
- Records of any tool certifications and employee certifications for tool usage.

The inventory should be issued by the company warehouse at the beginning of the job and updated as additional tools are sent out to the job site and damaged or unneeded tools are returned. A standard company form should be used for this purpose.

The sample Tool Control Sheet in Figure 33-1 is one practical example of a form for tracking tools on the job. One copy should be attached to the inside of each gang box; separate copies should be kept on file in the job site trailer.

NOTES

Notice that, in addition to providing space for recording the company control number of each tool, the name of the person the tool is issued to, and the date it is checked out and checked back in, there is also a column for noting tool costs. This is important. It lets every mechanic know the value of the tool he is signing out. Some companies issue separate tool price lists, though incorporating price information in their tool control sheets seems a more immediate and effective way to let employees know how costly it is to replace lost and damaged tools. As a result, many companies find that their employees guard more carefully against tool damage and theft.

Regardless of what type of form your company uses to control tools on the job site, the rule must be that no tool leaves storage without being properly signed out.

Regular Inspections

It is difficult to ask mechanics to have respect for the company's tools if the company demonstrates lack of concern for its tools and the safety of the people using them. On the other hand, a company that pays meticulous attention to the condition of its tools sets an example for its employees to follow.

For this reason, it is important that the person in charge of tools on the job site inspect them regularly, tag those that are in need of repair or replacement and return them to the shop.

Returning Unneeded Tools

An often forgotten element of good tool control is promptly returning to the shop or the warehouse all tools that are not in use. This practice has several advantages:

- It removes unnecessary tools from the job site inventory, making on-site tool control easier
- It moves unnecessary tools out of the reach of vandals and thieves, and
- It puts tools back in circulation so that they may be used on another job.

When a tool is returned to the company's warehouse or shop, the fact should be noted on both the job site and the warehouse inventories.

Time And Materials

Any Time and Materials (T&M) work that requires special tools must be listed and costed in the project contract. Tool rental costs should be determined by the office accounting department. Refer to your trade association rental guide for pricing. Costs for expendables should also be reviewed and included. T&M costs should be submitted in accordance with the contract.

TRAINING

The most cost-effective way to prevent damage to tools is to make sure each mechanic knows how to properly use those he is issued. Emphasize to everyone on the job that proper use and care prolongs the life of tools and enhances productivity and safety.

When a new or unfamiliar tool is introduced on the job, the project manager should make sure that someone with a thorough understanding of it demonstrates its proper use to all job site personnel. In addition, each job supervisor, crew foreman, and tool control supervisor in the company should keep an eye out for misuse of even the most common tools. If a mechanic seems not to understand how to use a particular tool, he should be taken aside, so as not to embarrass him in front of other workers, and asked to demonstrate the proper procedures for using and maintaining that tool. If he is unable to, he should be shown the proper procedures and then asked to explain the procedures he has been shown. As a follow-up, he should be monitored over the next few days to make sure he applies what he has learned.

It is important that records should be kept on each employee that is properly trained in the use of special tools as well as the use of safety apparel or goggles that are required to operate such equipment. Each employee must sign these training records to verify their understanding and completion of these training procedures.

CONCLUSION

Although it is a widely discussed topic throughout the construction industry, tool control is not difficult as long as the project manager assigns specific responsibilities and makes it clear to everyone on the job that the company's policies and procedures will be strictly enforced. It is, in the end, a matter of leadership and organization.

NOTES

TOOL CONTROL SHEET					
Job			Supervisor		
Employee in charge of tools on site					
Tool Description/ Control No.	Issued By	Issued To	Date Out	Date In	Cost

Figure 33-1 Sample Tool Control Sheet

CHAPTER 34 CONSTRUCTION EQUIPMENT

NOTES

SPECIAL CONSIDERATIONS

Construction equipment is among a company's biggest costs on a project. If the equipment is scheduled and handled properly, it more than pays for itself in the time and effort it saves. If improperly managed, however, construction equipment becomes a serious drain on company funds.

A COOPERATIVE EFFORT

Control of construction equipment has one central aim: to ensure that each piece of equipment is used to its maximum advantage. It is a cooperative effort among all the members of the project team, particularly the project manager, the job supervisor and the purchasing agent—an effort that begins with pre-planning and continues through to the last day of the project.

Clear written procedures are essential. Certain procedures apply to all situations; others only to equipment the company owns or to equipment the company rents specifically for the project. All must be followed and strictly enforced.

A PRACTICAL APPROACH

In planning for the most efficient use of construction equipment, the project team must:

- Review the scope of the project and the plans and specifications to determine equipment requirements
- Establish a budget for both company-owned and rented equipment, and stick to it
- Schedule the arrival, use, and departure of equipment in such a way as to minimize the amount of time the equipment is idle. Remember: idle equipment wastes money!
- Track all equipment costs related to change orders
- Assign specific responsibilities for equipment maintenance and operation and make sure the person(s) assigned understand and perform their duties
- Properly tag all equipment requiring maintenance, and
- Maintain a complete record on each piece of equipment on the job, including the number of hours of use budgeted to the project, the number of hours actually used, the dates of arrival at and departure from the job site, and all dates and reasons for which the equipment is tagged for repair.

RENTAL PROCEDURES

For equipment or special tools rented by your company, you should:

- Emphasize to everyone on the project team the importance of having the proper equipment on-site when needed and controlling rental costs
- Identify project requirements, including the type(s) of equipment needed, the quantities and sizes, and approximate dates of use
- With company management, decide which available option is best for each item—rental, rent-purchase, or purchase
- Consult your trade associations rental guide for appropriate rental fees and other pertinent information
- Select the appropriate vendor for each item
- Obtain any special insurance required, and make sure everyone on the project team knows the terms of the insurance and the company's liability
- Assign specific responsibilities for keeping records on all rented equipment, maintaining and repairing all rented equipment, and returning equipment and tools to their source as soon as they are no longer needed, and
- Keep an accurate log of all equipment rentals and their costs.

NOTES

For equipment rented by your company to other trades on the job, you should:

- Know what rental fees are fair, using your trade associations rental guide. Be sure also to consider the costs of expendable items such as those shown in Figure 34-1 when setting or negotiating fees.
- Maintain detailed, accurate records of all equipment rentals, including the date and time each item is rented, the signature of the person renting it, the date the equipment was/will be returned, the rental rate, etc. A sample Equipment Rental Record Sheet that can be used for this purpose appears in Figure 34-2.

SWAP OUTS AND TRADES

Swapping or trading equipment with other contractors on the job is very risky for two reasons:

- It places your company in jeopardy of legal action if property is damaged or people are injured through use of the equipment, and
- It could easily result in damage to your company's equipment—damage for which your company might not be compensated.

As a result, many contractors strongly discourage swaps or trade outs of any kind. Nonetheless, in the real world situations arise where swapping is practically unavoidable. The project manager must make it clear to every job supervisor that he must follow the company's policies and procedures to the letter when he finds himself in such a situation. In general, this means:

- Informing the project manager immediately, and
- Documenting the terms of the swap in writing and having the other party sign them.

CONCLUSION

Project funds spent on construction equipment will return big dividends if the project team plans carefully and enforces standard procedures for equipment use. Such steps also reduce a company's liability and increase job safety.

TYPICAL EXPENDABLE ITEMS

Abrasive Cutoff Discs
Acetylene
Argon
Brushes (paint, wire, fitting)
Chisels
Cleaning Fluids
Cleanout Plugs
Cutting Oil & Paste
Cutting and Welding Tips
Diamond Core Bits
Drill Bits-Diamond & Steel
Emery Cloth
Emery Wheels
Files
First Aid Kit Supplies
Flux
Foul Weather Gear
Gasoline
Gloves, Soapstone
Grinding Wheels
Hacksaw Blades
Hole Saw
Kerosene
Material Charge Tickets
Motor Oil
Napthalene
Nitrogen
Other Abrasives
Other Drill Bits and Saws
Other Fuels
Other Inert Shield Gases
Other Inert Test Gases
Other Lubricants
Other Printed Forms
Other Solvents
Oxygen
Paste Brushes
Pipe Cutter Wheels
Pipe Dies
Pipe Joint Compounds
Propane
Ramset Charges
Rod Dies
Sand Cloth
Sandpaper
Solder
Star Drills
Time Charge Ticketrs
Tip, Cutting
Tip, Cleaners
Tip, Welding
Tool Handles
Tungsten Tips
Twist Drills
Welding Hood Lens
Welding Rod
Wiping Cloths and Rags
Wire Brushes

While this list is by no means complete, it is intended to give a representative cross section of the type of items which may be classified as “Expendable Items.”

Figure 34-1 List of Expendable Items to be Added to Equipment Rental Rates

EQUIPMENT RENTAL RECORD SHEET					
Company			Job No.		
Record for Period		Beginning		Ending	
Item Rented	Rented To	Date Out	Date In	Rate	Total Charge

Figure 34-2 Sample Equipment Rental Record Sheet

NOTES

MANAGING COMPANY VEHICLES

The project team must control the use of company vehicles to assure that each vehicle is available when needed, maintained in good condition, protected from abuse, and operated only by authorized personnel. Vehicle liability and damage insurance policies specifically state the conditions for use of company vehicles—conditions aimed at preventing personal injury and vehicle or property damage. Your company's policies should be designed to enforce those conditions.

THE PROJECT MANAGER'S RESPONSIBILITIES

It is your responsibility to enforce your company's policies pertaining to vehicles assigned to your job, particularly those regarding personal use of company vehicles and use restrictions due to insurance concerns. To do this, you must be familiar with those policies and have a complete copy on hand for your own reference. You should also make them clear to everyone on the project and make sure that the project team enforces them.

You should implement the following control policies:

- Maintain a company vehicle log that is similar to the tool log
- Develop and maintain a preventive maintenance schedule for each vehicle
- Maintain up-to-date employee driving records; anyone with unsafe driving records must be prohibited from using company vehicles
- Develop a training log and sign-off sheet for each company vehicle that requires special training or operating procedures
- Maintain copies of insurance coverage for each vehicle assigned to the project
- Document vehicles used on time and materials or cost-plus jobs, and
- Ensure that vehicles are regularly cleaned and made ready for work.

Finally, insist that everyone responsible for company vehicles follows proper maintenance procedures. Vehicle maintenance is easy to overlook on a project where so many other details demand attention. However, vehicles are company assets, and caring for them properly helps minimize operating costs.

NOTES

HOW CLAIMS AND DISPUTES ARISE

A claim is a demand by one party for payment or other compensation from another party for work completed or conditions encountered outside the scope of the original project documents. A claim can be filed by a subcontractor against a project owner or general contractor, by a subcontractor against a prime contractor, or by one contractor against another.

In many cases a claim represents a legitimate disagreement between the parties. In others, a claim is a symptom of distrust between the parties. Either way, money is at stake, and both parties have an interest in having the claim settled in their favor, and at lowest cost.

THE BEST SOLUTION IS TO AVOID CLAIMS

Some suggestions to avoid claims are as follows:

- Maintain good communications and a good relationship with your customers and other contractors on the site
- Develop a high level of trust in these relationships. When parties trust each other, claims can usually be settled easily
- Manage all elements of your project well
- Settle differences (future claims) at the lowest possible level in your organization and your adversary's organization
- Remember that most disputes are based on honest misunderstandings on the part of both parties, and
- Have good project documentation.

ALTERNATIVE DISPUTE RESOLUTIONS

These six alternatives are listed in order of preference, with negotiation being the best method and litigation being the worst method, consuming the most time and money.

Negotiation

Most claims can be and are settled through negotiation, thereby saving both parties time, money and effort and preventing permanent damage to their business relationship. The negotiation can usually be accomplished in one or more private meetings and preferably without legal counsel being present. In preparation for negotiation, it could be worthwhile to privately consult your legal counsel.

Dispute Resolution Board

Both parties will select a member of the board, then these two members will select a third member. The board will then review the issues of the dispute and recommend a solution to the parties. This solution could be binding, but it is usually non-binding on the parties.

Mediation

The two parties will select a mediator (one with considerable knowledge and experience in construction) who will work separately with each party, and through a series of meetings try to bring the two parties to a common solution.

Mini-trial

The two parties will hire a retired judge, and each party will present their side to him. The judge will review the issues and render a decision (solution). This solution could be, but usually is not, binding on the parties.

Arbitration

Arbitration is a process whereby independent reviewers examine the evidence presented by both sides in a dispute and decide on a settlement. Most arbitration is done by the American

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Arbitration Association, an organization of professional arbitrators who are knowledgeable about the construction industry. The advantages of arbitration are that it is less costly and time-consuming than litigation and the reviewers are more familiar with the construction industry than are judges and juries. This alternative is growing to be almost as time-consuming and as costly as litigation.

Litigation

Taking a claim to court is the most costly and time-consuming route to settlement and should be used only as a last resort. The claimants should keep in mind also that by putting their claims in the hands of the legal system they are taking a serious risk because lawyers, judges, and juries often know little or nothing about construction practices and procedures. This risk should be weighed carefully before litigation is begun.

In seeking a resolution you must always remember that the final solution will be somewhere between the positions of the two parties. Usually, neither party will win 100% of what they want. Therefore, you should work to resolve any claim in the shortest possible time because this will save both time and money.

DOCUMENTATION

For a claim to be successful, it must be thoroughly documented. Situations that result in claims are often not recognized until long after they've occurred. If the job supervisor or project manager has not kept accurate and detailed job records throughout the project, it is impossible to properly document a claim. This is especially true if the claim goes to court, where the direction and the amount of the judgment often rely on documentation. This is one of the most compelling reasons for maintaining complete and accurate records of all events and conditions on the job.

Among the types of documentation useful in substantiating a claim are:

- Daily Job Logs—the single most valuable type of documentation because they are official, legal records of job events recorded and signed on the day the events occurred.
- Job Supervisor's Diary—useful for corroborating daily job logs. A diary is excepted from the legal hearsay rule and submissible as evidence if entries are made in the regular course of business and at the time the events occur, are original and unedited, and are based upon the first-hand knowledge of the person making them.
- Transcriptions of Tape—recorded Diary Entries—entries are submissible as long as they are completed as soon as possible after the entries are recorded, are complete and accurate, and are reviewed carefully and signed by the person making the entry, preferably on the same day as the recording is made.
- Photographs and Videotapes—especially effective as documentation, these items must be labeled with the date, the time and a description of what they show. The signature of the photographer must appear on the back of each photograph, and videotapes must be original and unedited.

Other important documentation includes:

- Correspondence
- Meeting and job conference minutes
- Supervisory interview
- Job cost reports (especially unit rate production figures)
- Delay surveys
- Change order requests and change work documentation
- Schedules
- Transmittal logs
- Discovery documents, and
- Consultant or expert witness analyzes.

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COMMON TYPES OF CLAIMS

Most claims fit into one of the following categories:

- Injury or damage claims which request compensation for personal injury or property damage resulting from an act or omission of one of the parties, his employees, his agents, or anyone else for whose acts he is legally liable
- Delay or disruption claims which request compensation for costs incurred as a result of a delay or disruption of the schedule resulting from the other party's actions or failure to act
- Change in conditions claims which request compensation for costs incurred due to the discovery of conditions that differ from those stated in the contract documents
- Change in scope claims which request an increase in the sum of the original contract due to an unforeseen increase in the amount of work involved in meeting the contract requirements
- Time extension claims which request an extension of the project schedule to compensate for events or conditions beyond the control of the claimant
- Termination claims which request compensation for costs incurred as a result of a project or a contractor's involvement in that project being terminated before completion, and
- Payment delay claims which request compensation for additional costs incurred as a result of not being paid according to the original agreed-upon schedule.

PRODUCTIVITY LOSS CLAIMS

Productivity loss claims result when a contractor feels that one or more factors beyond his control have hampered his company's efforts, delaying completion of certain work activities and then forcing him to accelerate his schedule later in order to complete the project on time. A productivity claim can cite any of several unforeseen site conditions or shortcomings on the part of the general contractor or project owner, such as:

- Lack of coordination of trades
- Delays in clarification of design
- Design constraints
- Changed site conditions
- Preceding work not completed as scheduled
- Unqualified inspections
- Excessive change orders
- Tardy responses to submittals and change requests
- Lack of access to work areas, and
- Work delays or suspension.

From the list of possible causes, you can see that a productivity loss claim can involve several factors listed under other types of claims. Where a productivity loss claim differs from other types of claims, however, is in the fact that it cites impact on productivity as the cause of the losses incurred, particularly:

- Loss of momentum and productive rhythm
- Redundant mobilization and demobilization
- Demoralization of work force and supervision
- Disruption of orderly flow of materials
- Excessive short-term and long-term replanning
- Uneven manpower loading for the project
- Need for additional management and supervisory staff
- Congestion and crew interference, and
- Inability to achieve learning curve improvement.

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Several of these effects are often difficult to prove in a court of law. Nonetheless, they are legitimate grounds for a claim and should be considered. In substantiating a productivity loss claim, the contractor should calculate the total costs involved (see "Cost of Claims," below) and establish that:

- The original bid was reasonable
- The costs claimed are reasonable
- The contractor is not responsible for any of the losses claimed, and
- There is a significant difference in productivity between impacted and non-impacted areas or time periods.

THE DIFFERENT VIEWPOINTS OF CLAIMS

There are two sides to every story. There are also two perspectives in every claim situation. When a project owner files a claim against a contractor, the contractor is likely to cite the reason for the claim as the owner's:

- Financial difficulty and payment delays
- Increased retainage
- Work suspension or stoppage
- Schedule interference
- Errors in specifications or drawings
- Late drawings and specifications
- Excessive changes and rework
- Delayed decisions or quality approvals
- Construction method interference
- Excessive inspection or quality control requirements
- Differing site conditions
- Limited site access
- Interference with work crews, or
- Owner-furnished equipment or material constraints.

When a contractor files a claim against an owner, the owner is likely to cite the reason for the claim as the contractor's:

- Inefficient management and supervision
- Inability to coordinate subcontractors
- Lack of planning, scheduling and control
- Lack of motivation among supervisors and workers
- Work force skill level constraints
- High percentage of absenteeism or turnover
- Inefficient procurement, warehousing, and delivery of materials
- Insufficient tools, equipment, and scaffolding
- Strikes, slowdowns, and other union actions
- Ineffective quality control and excessive rework, or
- Contractor's or subcontractor's bid too low.

When a general contractor files a claim against a subcontractor, the subcontractor is likely to cite the reason for the claim as the general contractor's:

- Lack of planning, scheduling, and control
- Inability to coordinate subcontractors
- Delays in progress payments, or
- Inability to control quality deficiencies of other subcontractors.

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THE COST OF CLAIMS

The primary reason for filing a claim is to recover costs incurred as a result of some action on the part of the other party. Among the costs to be considered in determining the amount of a claim, the contractor must consider:

- Labor hour overruns
- Wage increases
- Material quantity overruns
- Subcontract overruns
- Additional site and office overhead
- Additional equipment and tools
- Finance charges
- Mobilization and demobilization
- Lost opportunities, and
- Claim preparation fees.

DETERMINING WHETHER TO FILE A CLAIM

Filing a claim is a serious matter. It is not a course of action that a company takes automatically whenever it disagrees with a project owner or general contractor.

There are many considerations involved in deciding whether or not to file a claim. The primary ones are:

- Is the claim legitimate?
- Is the amount involved worth the effort?
- What are the chances of winning the dispute and recovering the amount claimed?
- What effect will filing a claim have on future business relationships with the other party, other customers, and potential customers?

These are considerations that the project manager cannot decide upon alone. He should consult with company management whenever a possible claim situation arises.

There are some situations in which the company has little choice but to file a claim, especially:

- Where large sums are involved, or
- When winning the claim is necessary for the survival of the company.

PROCEDURES

Contract Review and Legal Counsel

The first step in filing a claim is to review what the contract documents say next about claims and disputes and about the situation on which you are basing your claim. Next, get professional legal advice on proceeding with the claim. Do not file any claim without first consulting with an attorney familiar with your company.

Notice of Protest

If the project schedule or other factors require your company to perform work over which a dispute exists, submit a Notice of Protest to the appropriate party (see Figure 36-1).

CONCLUSION

Claims are unpleasant. They are costly in terms of money and management time and effort, and should be avoided. Because construction projects are nightmarishly complex affairs where the unexpected is inevitable and no contract can cover all bases, Alternative Dispute Resolutions rather than litigation, should be used. Claim settlement is also more difficult because large sums of money are usually involved.

- Avoid them by knowing what the contract documents say and maintaining good relationships with your customers and the other trades on the job. If the parties on both

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sides of a dispute trust each other's basic motives, there is a good chance of settling the claim with a minimum of pain and expense to both parties.

- Be prepared for them through good documentation by maintaining complete and accurate job records from the first day of the project to the last.

Date:

Architects & Associates
Street
City, State Zip Code

Attention: Project Architect

Subject: City Hall, Your City, USA

Project: Notice of proceeding under protest

Gentlemen:

We disagree that the requirement to fill in the cistern recently discovered at the job site is a requirement of our contract. In accordance with the provisions of the contract and your directive to us to perform this work, we are *proceeding under protest.*

We will keep a separate accounting of all costs required to accomplish this work. When the work is completed, we will render to you our invoice for all costs incurred including all impact costs as imposed on our basic contract work plus profit and overhead. In addition, we will inform you of the required time extensions caused by this work when such time extensions are known.

We sincerely wish you would again review this item and issue an appropriate change order to perform this work instead of compelling us to proceed under protest.

Your prompt response will be appreciated.

Respectfully,

John Doe
Project Manager

Figure 36-1 Sample Notice of Protest

CHAPTER 37 EQUAL EMPLOYMENT OPPORTUNITY AND AFFIRMATIVE ACTION

NOTES

THE ROLE OF EEO AND AFFIRMATIVE ACTION

The 1964 Civil Rights act prohibits discrimination against anyone because of race, color, religion, sex, national origin, or age. Since 1964, other laws have been enacted including disability discrimination, to ensure that everyone willing and able to work has the opportunity to do so.

The Equal Employment Opportunity (EEO) and Affirmative Action programs are the means by which laws against discrimination are enforced and everyone is given a fair chance for suitable employment.

YOUR COMPANY AND EEO

EEO and Affirmative Action are the law. As a result, your company can face legal prosecution if it does not comply with these programs.

Specifically, your company is required to:

- Have its own Affirmative Action plan if your company is a government contractor or subcontractor to a government contractor.
- Ensure that all company facilities remain desegregated, both in policy and in use
- Afford all employees full opportunity and encouragement to participate in all company-sponsored educational, training, recreational, and social activities, and
- Conduct regular reviews of all supervisors' adherence to, and performance under, the company's EEO policies and Affirmative Action obligations.

THE PROJECT MANAGER'S RESPONSIBILITIES

As project manager you are particularly aware of a job's manpower needs. This puts you in an excellent position to help your company meet EEO rules and regulations. In this regard, your responsibilities are to:

- Be familiar with and maintain a current copy of your company's policies (Reference: MCAA's EEO and Affirmative Action Manual)
- Comply with all EEO and Affirmative Action regulations that are required
- Be certain all members of the project team, particularly your job supervisors, understand and follow proper EEO and Affirmative Action policies
- Instruct all members of the project team to inform you immediately of any EEO- or Affirmative Action-related situation that they are not sure of how to resolve
- Assist your company officers in identifying and resolving problems related to EEO and Affirmative Action
- Regularly discuss EEO and Affirmative Action with labor representatives to verify that your company's policies are being followed
- Make sure your company's EEO and Affirmative Action policy is clearly posted in an area accessible to all workers on the job
- Maintain a working environment free of harassment, intimidation, coercion, and other forms of discrimination, particularly toward minority, female, and handicapped employees
- Instruct your job supervisors to check regularly with all employees to determine if, in fact, discrimination is occurring on the job site
- Encourage minority, female, and disabled employees to inform other minority, female, and disabled workers, as job openings occur
- Review potential promotional and training opportunities with minority, female, and disabled employees

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- Keep all company facilities desegregated
- Encourage all workers equally to participate in company-sponsored educational, training, recreational, and social activities, and
- Remain accessible to minority, female, and disabled employees and responsive to their on-the-job, work-related problems.

CONCLUSION

In an ideal world, EEO and Affirmative Action laws would be unnecessary. Everyone would be hired on the basis of his abilities, evaluated by his or her performance, and trained and promoted to the limits of his capabilities. However, our world is imperfect, and the prejudices of some have forced the enactment of laws for all. These laws, too, might be imperfect; however, their intention—to establish equal opportunities for everyone—is a reflection of our nation's most basic values. Keep this in mind in handling all matters related to EEO and Affirmative Action.

CHAPTER 38 JOINT VENTURES

NOTES

WHAT IS A JOINT VENTURE?

A joint venture (sometimes called a "co-venture" or "joint adventure") is a cooperative effort in which two or more companies combine their resources to earn a joint profit and each company shares the resulting profit (or loss) in proportion to the resources it has contributed to the effort. The purpose of a joint venture is to allow companies which are not, on their own, qualified or equipped to tackle a project, to form a temporary partnership that is properly qualified and equipped. For example, a company, which has the necessary skill and knowledge but lacks the required money and equipment, can enter a joint venture with a company that has money and equipment but not sufficient skill and knowledge, and both benefit.

The details of each joint venture vary with the agreement between the parties. However, most are formed for one project or undertaking only and are characterized by joint project control and management and full sharing of profits and losses. Because a joint venture is a short-term arrangement, it is not a true partnership in the legal sense. Nonetheless, most of the rules that govern partnerships apply to joint ventures and the rights of two parties.

JOINT VENTURES IN CONSTRUCTION

In the construction industry, a joint venture can be between two or more corporations or firms in the same field or in different fields. Two specialty contractors, neither of which has the capacity to bid or complete a particular project, might form a joint venture that enables both to cooperatively bid and perform the work. Similarly, a trade contractor might join with an architect, engineer, general contractor, and electrical contractor to furnish an owner with a "turnkey" project. In both cases, the result is to increase competition by creating a new bidder.

Occasionally, joint ventures are formed by companies, which have the ability and capacity to bid and perform the work on their own. Where the intention of such a venture is to reduce or eliminate competition, there is danger of violating existing antitrust laws.

ADVANTAGES OF A JOINT VENTURE

Contractors enter into a joint venture for many reasons. Among the most common are:

- Guard against mistakes in bidding by cross-checking and dual estimating
- Increase working capital
- Provide or expand bonding capacity or decrease bonding cost
- Strengthen management skills and technical expertise
- Secure specialized and complementary skills
- Increase the labor supply
- Pool equipment
- Reduce overhead expenses
- Share the risk of loss, and
- Involve a local contractor (in cases where an out-of-town contractor forms a joint venture with a local contractor) who is familiar with local market conditions, suppliers, labor, licensing, and permit procedures, etc.

Essentially, all of these advantages boil down to one: a joint venture gives the parties involved the ability to bid and perform larger and more complicated or specialized jobs. A joint venture holds an advantage for the project owner too, because it gives him an additional bidder to consider and a well-qualified contractor usually at a lower cost.

RISKS OF JOINT VENTURES

A joint venture holds all of the risks of a partnership but none of the safeguards and limitations of a corporation. Consequently, a company must be extremely careful in selecting its venturing partners. The size of the risk in terms of dollars and reputation depends on each company's

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ability to cooperate and communicate with the other. It also relies on the financial strength of all parties involved. The benefits of a joint venture can be lost overnight through the insolvency or bankruptcy of one member.

JOINT VENTURES AND THE PROJECT MANAGER

In most cases, the existence of a joint venture will not affect the project manager's control of the project at all; in others it will, and he must have a clear idea of the project's organization and ground rules before starting work. He must establish from the start how job management is to be handled, what limits, if any, the joint venture places on his authority, and whom he is directly answerable to.

The project manager must also lend his full support to making the joint venture successful for his company. This means developing and maintaining good communications and cooperation with the company's co-venturer. Conflicts that cannot be resolved in the field should be referred to the proper channels within the company.

PROJECT MANAGER'S RESPONSIBILITIES

The project manager must understand that a joint venture creates a merger of separate corporate cultures. Each corporate entity has its distinctive requirements and procedures. The project manager must become aware of these differences, determine their potential impact on job performance, and then establish a specific set of procedures that will satisfy the needs of each corporate entity while accomplishing the overall goals of the joint venture. A meeting would be advisable to clarify and identify all corporate requirements and to establish the mutually acceptable procedures that will be implemented to the completion of the project (see Chapter 20).

CONCLUSION

Joint ventures are an increasingly common means for construction firms to obtain work that would otherwise be beyond their resources and capabilities. Like any partnership, however, a joint venture is a blend of advantages and risks, and success relies heavily on the relationship between the parties involved. By understanding how a particular joint venture is organized and how it affects his job, and establishing a good working rapport with his company's co-venturer, the project manager helps to ensure the success of the venture.

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A FRAMEWORK FOR WORKING TOGETHER

The labor agreements negotiated in your area and the personnel policies established by your company are a framework for cooperation between management and labor. Together they provide:

- A clear approach to getting jobs completed
- Specific work goals and conditions, and
- Standards for job performance.

Agreements and policies work effectively only in an atmosphere of positive management-labor relations—an atmosphere of open communication, trust, respect, and mutual concern for doing the job well. The project manager's leadership is an important key to creating and maintaining that atmosphere.

THE PROJECT MANAGER'S RESPONSIBILITIES

Know the Rules

Labor agreements and personnel policies can work for or against the project effort. To ensure that they work in your favor, the project manager has to be sure that the members of the project team have a working knowledge of the following:

- Labor agreements. Particularly those sections related to:
  - Work hours, starting time and quitting time
  - Wages, including rules governing shift time and overtime and how they affect the job schedule
  - Crew composition, especially as it affects productivity. If pre-apprentices or trainees are available to you, learn to use them effectively.
  - Supervision, and
  - Work rules as they relate to the project.
- Project agreements. If the project is covered by a specific project agreement, the project team should review it thoroughly during pre-planning. The project manager should hold a meeting with the general contractor or construction manager to discuss the impact of the agreement on the project.
- Jurisdiction procedures. Understand the two ways of establishing trade line jurisdictions:
  - "Area practice," which may be settled by discussions with labor representatives, and
  - Arbitration through the Plan for the Settlement of Jurisdictional Disputes for contractors who are stipulated to that plan.
- Company policies. Be especially familiar with these areas of your company's personnel policy:
  - Safety, particularly OSHA guidelines that pertain to the job (see Chapter 17)
  - EEO and Affirmative Action (see Chapter 37)
  - Hiring procedures, and
  - Termination procedures, especially as they relate to firing.

Be certain your company policy has provisions for:

- Disciplining employees for conduct such as excessive absenteeism, theft, insubordination, vandalism, or violation of company policies
- Keeping the office notified of all disciplinary actions
- A review by the project manager of all firing decisions made by the job supervisor
- Explaining the cause of termination to the fired employee at the time of firing, and
- Maintain records of reasons for which employees are terminated

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- Reductions in work force and how they are handled.

Maintain Communications with Labor Leaders

Establish good relations with labor leaders right from the start. Hold a pre-construction meeting with your company's labor liaison person and union representatives to:

- Agree on ground rules for the project
- Ensure compliance with trade jurisdictions, and
- Determine a schedule for regular meetings and special meetings, when necessary.

Make sure that a member of the company or project staff is assigned to act as sole liaison with the union business manager. Make sure your assignee keeps them informed about all situations regarding labor and solicits their recommendations and cooperation for the project's labor relations effort.

Work to develop a project environment where management and labor view the project as a mutual venture with potential rewards for both. Learn to see problems as opportunities to develop creative ways to do things better and meet the customer's needs in a more competitive fashion.

Handle Layoffs Properly

Layoffs occur when a project's schedule dictates changes in the work crew. In some cases, they are a result of poor scheduling or excessive hiring. You can control layoffs through good planning and wise manpower scheduling. When a layoff is required, inform the union business manager in advance and make every effort to send the affected employees to another project.

CONCLUSION

A divided team can not easily do good work. If the project manager wants to ensure the profitability of his project, steps must be taken to unify management and labor in a concerted effort. Goals must be set that both can subscribe to.

CHAPTER 40 QUALITY CONTROL

NOTES

PROJECT QUALITY CONTROL: AN INVESTMENT

Providing quality work at competitive prices is what wins a company work and earns repeat business. A reputation for quality at a fair price is among the best advertising your company can have. Quality control—the procedure ensuring quality materials and workmanship—is an investment in that kind of reputation, and therefore a good way for the project team to help build job security. It all begins with each member of the team taking personal responsibility for quality control.

DEFINING STANDARDS OF PROJECT QUALITY

Any approach to project quality control has to start with defining the project's quality control standards. These standards come from three sources:

- The contract documents, including the drawings and specifications and the special requirements of the owner or general contractor,
- The contractor's in-house standards, and
- The contractor's Total Quality Management (TQM) program.

The contract describes the exact standards for all work done on a given project—standards that must be met for the customer to be satisfied and the specialty contractor to be paid fully for his efforts. But the quality standards of any project are more difficult to achieve if the specialty contractor has no in-house standards developed through a TQM program. In-house standards give everyone a baseline for making project quality control decisions. Like other company policies and procedures, they define acceptable performance and offer guidelines for achieving it. In-house standards of quality also demonstrate the company's commitment to quality, setting an example for all its employees.

Whenever the standards of quality stated in the contract differ from those established by your company, the contract takes precedence. Such situations often are opportunities for the company to refine its own standards and enhance its reputation.

ESTABLISHING PROJECT PROCEDURES

During pre-planning the project team should establish procedures aimed at meeting both contractual and in-house standards of quality. These procedures should encompass such areas as:

- Inspections by project management (see Figure 40-1)
- Code inspections
- Tests
- Welder certifications
- Quality control documentation, and
- Integration with your company's TQM program.

Among the specific procedures that every manager and supervisor on the job should follow on every project:

- Know the quality control standards of the company and the project contract and stick to those standards from the first day of the job
- Know, understand, and participate in your company's TQM program
- Establish "quality consciousness" among all field personnel, and invite crew members' suggestions and comments regarding quality control on the job
- Monitor the performance of all mechanics to make sure the highest standards of workmanship are being met
- Encourage mechanics to continue their career and skills training
- Take responsibility for quality control of all subcontractors' work

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- Follow established methods for ordering and receiving all materials and equipment, to make certain they meet or exceed job requirements
- Follow detailed written procedures for installation, testing, and repair activities
- Notify the appropriate members of the project team of any quality control problems that occur
- File quality control reports, as required by your company, and review them for accuracy and completeness
- Regularly conduct quality control inspections to verify:
  - Quality of installation
  - Internal and external cleanliness of all systems
  - Accuracy and completeness of as-built drawings
  - Compliance with state, local, ASME and in-plant codes
  - Acceptability of work performed by subcontractors
  - Adherence to good housekeeping practices, and
  - Work with your company's TQM program to be sure you incorporate in your project all current company quality concepts.

ASSIGNING PROJECT QUALITY CONTROL RESPONSIBILITIES

The project manager should assign specific project quality control responsibilities to every member of the project team, particularly:

- Field supervisor
- Shop foreman
- Warehouse foreman
- Subcontractors
- Quality control specialist, and
- Other key in-house support personnel, such as project engineers and drafters.

Keep in mind that quality control gets results only if it is treated like every other requirement of the job.

QUALITY CONTROL VS. PERFECTION

It is important to be serious about quality control and to make sure that everyone on the project team knows how serious you are. However, avoid fanaticism. The goal is to install systems that "look right and work right," not necessarily to achieve perfection. Perfection is not always achievable at realistic cost.

When faced by a situation where you are not sure if a piece of work meets the project's or your company's quality control standards—particularly standards of appearance as opposed to function—consult the project documents and your company's quality control policies as soon as the question arises. Acting immediately is the only sure way to avoid installing non-conforming work that must later be removed and reinstalled or otherwise corrected. Rework is terribly costly both in dollars and morale.

CONCLUSION

Quality control is an organized effort to make sure that every piece of work done by your company is worth what the customer pays for it and stands as a reasonable example of the workmanship you want to be known for. If you keep this definition in mind and tailor your quality control procedures to fit it, you are almost assured of a program that pays big dividends.

SAMPLE QUALITY INSPECTION LOG			
JOB NO.		JOB NAME	
PERMIT NO.		AHJ	
INSP. NAME		PHONE NO.	

DATE	APPROVED	AREA INSPECTED

Figure 40-1 Sample Quality Inspection Log

CHAPTER 41 AS-BUILT DRAWINGS

NOTES

THE IMPORTANCE OF AS-BUILT DRAWINGS

As a job progresses, changes are made. By the time a project is completed, certain parts of it may be completely different from the original plans. As-built drawings ("as-builts") are drawings created as construction proceeds in order to accurately record such changes. They are important because:

- They are the only way to track and record how the job is actually built, and
- When future maintenance or repair is needed or an emergency arises, they are the only sure way the project owner has of knowing exactly where project components are located and how they were installed.

AS-BUILTS AND YOUR COMPANY

Accurate as-built drawings are important to your company because:

- Every project contract requires that as-built drawings be maintained as the job progresses
- The project owner will withhold retainage on the job until the as-builts are submitted, and
- As-builts are a great sales tool. If the project owner misplaces his set of as-builts but your company keeps its set, your company can get future service and construction work almost automatically.

THE PROJECT MANAGER'S RESPONSIBILITIES

As with so many other aspects of the project, ensuring that as-builts are properly maintained is a matter of setting strict procedures and enforcing them. The project manager should assign a specific individual—preferably the job supervisor—with full responsibility for the as-built drawings and should make clear to him that he must:

- Keep his copy of the as-builts clean and in good shape by storing them in the job office and not using them for construction
- Update his copy of the drawings daily, before he forgets important details and the work of other trades covers the changes and makes it impossible to verify them
- Makes sure that subcontractors update their as-builts daily and keep their copies in good shape, and
- Submits copies of all as-builts to the office on schedule so that final drawings can be drafted and prepared for submission to the project owner.
- Must make sure that the job superintendent receives a clean and complete copy of the contract drawings to use strictly as as-builts
- Log every change as soon as you receive it
- All RFI's and other documents impacting drawings should be incorporated in the drawings as appropriate
- Use a colored pen to highlight the drawing changes on the most current drawing you have
- Tape all 8-1/2" x 11" sketches, showing changes, to the drawing of the same building area
- Make sure each subcontractor's job supervisor receives complete drawings of all changes, whether or not they directly affect his part of the job, and
- Update your construction drawings just as you do your as-builts—daily.

CONCLUSION

Quality as-built drawings reflect the installed conditions including all change order work. Properly maintaining as-builts is not a difficult task. However, it does require a set routine for your job supervisor and your subcontractors' job supervisors to follow every day, and a uniform procedure for dealing with change work.

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YOUR COMPANY'S RESPONSIBILITIES

The project contract requires your company to:

- Demonstrate that the equipment and systems you have installed function according to the specifications of the manufacturer and the project documents, and
- Provide the project owner with operation and maintenance instructions for all equipment and systems.

Start-up is the phase of the project when both requirements are met.

THE PROJECT MANAGER'S RESPONSIBILITIES

The best insurance for a successful start-up is to install the equipment and systems properly. This is a project-long responsibility that requires the project manager to make sure that the job supervisor and the installation crews:

- Read the manufacturer's instructions carefully
- Check the manufacturer's identification numbers against those in the job plans to avoid costly installation errors
- Resolve any problems or confusion regarding installation before beginning work
- Stencil or tag all equipment with identification numbers, as required, before installation. This avoids installation errors and saves time and effort at the end of the job, and
- Follow the manufacturers' instructions throughout the installation procedure.

Once installation is complete, the project manager must be sure that all systems are ready for start-up when the start-up date arrives. This means assigning someone on the project team the responsibility for:

- Preparations, including:
  - Final lubrication
  - Removal and replacement of temporary filters
  - Proper rotation of pumps, fans, chillers, etc.
  - Testing, evacuation and charging of refrigerant piping, and removal of shipping blocks
  - Checking all power and control wiring
  - Aligning all equipment
  - Verifying that all utilities are operational
  - Testing, flushing, and filling of all piping systems, and
  - Scheduling factory personnel to be present to conduct or assist with start-up.
- Final Inspection
  Use a Pre-Start-up Checklist, such as shown in examples in Figure 42-1, as a basis for a final inspection to make sure all items are ready for start-up. Many times it is necessary to make a project specific start-up checklist.
- Notifications
  - Notify the testing, balancing, and other system vendors of the start-up date and arrange for a qualified technician to be on hand to assist during start-up and balancing procedures. The contract documents usually specify third party agencies, if required, for start-up, testing, and balancing
  - Notify the owner so that his representative can be present at start-up testing, and balancing procedures (see Figure 42-2), and
  - Notify the owner that instructions for operation and maintenance of equipment will be given as part of the start-up procedure.

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- Documentation
  - Prior to the start-up date, gather the following:
    - A fully revised equipment submittal booklet
    - A complete set of plans
    - All warranty documents
    - All necessary start-up check test and balance forms, and
    - A complete set of factory start-up instructions.
  - During start-up:
    - Document all start-up activities and results, and
    - Verify that all results are accurately recorded.
  - After start-up:
    - Transmit copies of the start-up report to the project owner, the general contractor and the company office.
- Instruction
  - Turn over all required documentation, including operation and maintenance manuals, submittal data, as-built drawings, warranty information, test reports, etc. to the owner's representative
  - Instruct the owner's representative regarding proper operation and maintenance of the system, and
  - Convince him to agree to use your company for long-term maintenance and repair service of the system after construction is complete.

CONCLUSION

Start-up is the demonstration which proves the quality and reliability of the work the project team has done. It should be viewed as much as a customer relations activity as a requirement of the contract and arranged and prepared for to put your company in the best possible light.

PRE-START-UP CHECKLIST		
Project Name		Project Number
System being checked		
Start-up Date		Date of Pre-Start-up Check
INSTRUCTIONS: CHECK OFF EACH OF THE ITEMS BELOW AS IT IS VERIFIED		
	Locations of all units verified with drawings.	
	Discrepancy noted on project plans (If location of a unit varies from the plans)	
	Insulation completed	
	Final Connections completed	
	Temperature Controls ready	
	Equipment lubricated per manufacturer's instructions	
	All equipment requiring identification numbers has been given them	
At the job site and ready for use		
	Hydronic cleaner	
	Chemical treatment	
	Freon	
	Refrigerant oil	
	Filters	
	Pipe identification tags are in place	
	Valve tags are in place	
	Typed directories of pipe identification tags and valve tags are completed and at the job site.	
Air handling equipment		
	All belts and drives are installed	
	Hand down bolts or blocks have been removed	
	All electrical components (starters, heaters, contacts, etc.) are ready for operation. (Test by "bumping" the units, but do not leave them running.)	
	Duct work is continuous and complete	
		Dampers
		Flex connections
		Grilles
		Other (specify):
	Temperature controls are ready	

Figure 42-1 Pre-Start-up Checklist (Sheet 1 of 2)

Pumps and related piping systems		
	Alignments completed and checked	
	Required grouting for equipment bases has been arranged	
	Gauge cocks are in place at the suction and the discharge of each pump	
	Gauge cocks, air vents, thermometers and temperature control probes have been installed according to contract documents.	
	System has been cleaned and flushed.	
	All strainers are clean.	
	All electrical components are in working order (per Item 3 under Air Handling Equipment, above)	
	Locations of all units verified with drawings.	
		Discrepancy in location noted on project plans (If location of a unit varies from the plans)
	All unit components and systems are connected, including	
		Vents
		Gas lines
		Make-up water
		Condensate
		Drains
		Fuel lines
	All electrical components are installed and in working order	
	All controls are installed, connected and ready	

Figure 42-1 Pre-Start-up Checklist (Sheet 2 of 2)

NOTICE OF START-UP

Date:_____

TO:

FROM:

PROJECT REFERENCE:

The following mechanical/electrical equipment or systems have been installed, checked and tested:

_____

_____

_____

This equipment will be put into beneficial operation beginning _____

Our guarantee period for this equipment will also begin on this date.

Figure 42-2 Sample Notice of Start-up

CHAPTER 43 CLOSE-OUT

NOTES

THE FINAL TEN PERCENT

The end of a job is not an easy time. There are many loose ends to tie up, and everyone is anxious to move on to the next project. The old adage, "The final 10 percent of the job takes 40 percent of the team's effort" proves itself repeatedly. All the little details can threaten the sanity of the best project manager.

At the same time, the end of the project is what the general contractor or the project owner remembers best long after the job is finished. As a result, your company's performance in the final days makes a strong and lasting impression.

THE PROJECT MANAGER'S RESPONSIBILITIES

The project manager has four primary responsibilities related to the closeout of the job.

- Encourage everyone on the team to be "punch list-conscious" from the first day of work. During the course of the project, make every effort to complete each task before moving on to the next, in order to avoid long, involved punch lists at the end
- Prepare and act on your own preliminary punch list (completion list)
- Complete all job close-out procedures specified by the contract documents and your company's policies, and
- Maintain your team's motivation until all details of the job are completed.

ITEMS TO CONSIDER

Closeout involves attention to detail. Most of those details are related to the following:

- Quality control
- Testing
- Preliminary inspection
- Start-up
- Completion of as-built drawings
- Instruction of owner
- Warranty initiation
- Completion of final punch list, and
- Demobilization.

PROCEDURES

Quality Control

The purpose of quality control is to make sure that the quality of the work meets the requirements of the contract documents and enhances the reputation of the company. The procedures for doing this begin on the first day of the project and include:

- Establishing quality control policies and procedures at the beginning of the project and enforcing them throughout the course of the job
- Regularly conducting quality control inspections to verify the acceptability of all work performed by company crews and subcontractors, and
- To maintain good housekeeping practices.

As part of his preliminary inspection at the end of the job, the project manager must:

- Verify that all work conforms to the scope of work and the project documents
- Review inspection reports completed by quality control personnel throughout course of project
- Identify areas where problems remain

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- Assign responsibility for correcting problems, and
- Ensure that all tests have been successfully completed and documented.

More information on quality control can be found in the "Quality Control" (see Chapter 40) section of this manual.

Preliminary Inspection

Like quality control, preliminary inspections are not limited to the end of the project. They should be conducted regularly to ensure that all work in each area is completed before crews move on to another area. To avoid leaving all the detail work—tagging, touch-up, etc.—until the end of the project, these tasks should be used as fill-in work when weather or other situations delay construction activities.

As the project draws to a close, the project manager should conduct a thorough preliminary inspection of the job to:

- Ensure proper installation of all systems and components, and
- Reduce potential number of items on customer's final punch list.

By identifying details that need attention and acting on them before the customer conducts his own inspection, the project manager minimizes end-of-project detail work and creates a good impression of his company's thoroughness.

The procedure to follow is to:

- Use a preliminary punch list and punch list such as the one in the Job Completion Checklist examples (see Figure 43-1 and Figure 43-2) as a guide for conducting your inspections, modifying the lists as necessary to meet the specific contract requirements
- Assign responsibilities for completion of all items identified as incomplete, and
- Conduct follow-up inspection before the customer conducts his own final inspection, to be sure work has been completed.

INSTRUCTING THE PROJECT OWNER

Giving the owner's representative adequate instruction in the operation and maintenance of installed systems is a matter of courtesy as well as a requirement of the contract. It is also a potential opportunity to discuss your company's obtaining a service and maintenance contract on the installed system.

The project manager's first step is to schedule the instruction session. If possible, he should combine the instructions with start-up. This saves him from having to hold a separate session and prevents the owner from delaying the instruction session. The project manager should get the client to sign off on receiving adequate instruction, training, and the O&M manuals.

The instructions given should include the following:

- A detailed review of the operation and maintenance manuals and other relevant information, and
- A discussion of the project manager's company obtaining a service contract.

To obtain the service contract, the project manager should emphasize the company's familiarity with the system. Once a service contract is agreed to, he should complete the necessary paperwork immediately and provide his company's service department with copies of the operation and maintenance manuals and the as-built drawings for the project.

Initiating the Warranty

Initiation of the warranty on a system marks the transfer of responsibility for that system from the specialty contractor to the project owner and the manufacturer. Consequently, it's important that the project manager do it at the earliest possible date to relieve his company of liability.

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The procedure to follow is:

- Notify the owner in writing of that date when the warranty period starts (see Figure 43-3), and
- Notify the manufacturer, if applicable.

Demobilization

Demobilization is the removal of all specialty company personnel, tools and equipment from the job site and the final cleanup of all work areas. Strict procedures must be established for demobilization to avoid leaving behind materials, tools, and equipment and incurring back charges for failure to leave the job site in the condition prescribed in the contract documents.

These procedures should include:

- Scheduling the removal of all company property just as carefully as you schedule its delivery to the job site
- Initiating a system to account for all tools and equipment, including assigning responsibility for collecting all tools and equipment, checking them against the initial job site inventory, and returning them to company warehouse
- Returning all unused materials either to the company warehouse for use on other projects or to the supplier for credit, and
- Inspecting the job site when demobilization is completed to verify that necessary clean up has been done and all company property has been removed.

You can find additional information pertinent to demobilization in “Material Handling” (see Chapter 29) and "Tools" (see Chapter 33) sections of this manual.

Punch Lists and Completion Lists

The project owner’s or general contractor’s inspectors prepare the punch list for the closeout of the project. It lists all the details that must be completed before the project owner will release the final payment to your company.

Despite the importance of the final punch list, it’s important that the project team not begin work on any punch list item until the entire list has been reviewed to ensure that everything on it is within the specialty- contractor’s scope of work.

To minimize the number of items on the punch list and get a head start on project closeout, clear up as many loose ends as possible ahead of time by:

- Inspecting the job yourself before the project owner’s inspectors do and preparing a completion list of all items that must be completed or corrected. As a basis for this inspection, use the first section of the Job Completion Check List (see Figure 43-1 and Figure 43-2)
- Preparing a separate completion list for each of your subcontractors
- Assigning specific responsibilities and deadlines for completing all items on the completion lists, and
- Inspecting all work areas to make sure that your crews and your subcontractors have finished work on all items on the completion lists before the owner’s or general contractor’s inspection.

When the final punch list comes to you:

- Review all items to make sure they are within your company’s scope of work
- Assign specific responsibilities for completing all items that are within your company’s and your subcontractors’ scope of work
- Conduct a follow-up inspection to ensure that all necessary work has been completed satisfactorily
- Notify the project owner or the general contractor that all punch list items have been completed

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- Accompany the owner's or general contractor's inspectors on their final inspection tour so that you are available to immediately answer questions they might have, and
- Obtain the customer's sign-off and authorization for final payment.

CONCLUSION

Instituting clear and straightforward procedures for the end of the project goes a long way toward making this difficult period easier. It also ensures that your company receives final payment and leaves the project owner and the general contractor with a favorable impression of its performance.

JOB COMPLETION CHECKLIST

Date			Job Number	

ITEM		CHECK WHEN COMPLETED
A. Company preliminary punch list		
1.	Valve tags installed	
2.	Pipe markings installed	
3.	Testing and flushing complete	
4.	All equipment aligned	
5.	Proper rotations of mechanical equipment checked	
6.	Systems sterilized and filled	
7.	Utilities energized	
8.	Damaged insulation repaired	
9.	Touch-up painting completed	
10.	Thermometers, gauges and flow devices installed	
11.	Condensate drains trapped, supported and properly pitched.	
12.	Temporary filters replaced	
13.	Housekeeping completed.	
14.	Startup completed	
15.	Factory start up personnel scheduled	
16.	Instructions to owner complete	
17.	As-built drawings completed	
18.	Testing and balance completed, reports issued	

B. Punch List		
1.	Completion date established	
2.	Copies turned over to subcontractor and company personnel	
3.	All items checked	
4.	Proper authority notified of completion	

Figure 43-1 Job Completion Checklist (Sheet 1 of 2)

C. Demobilization		
1.	Tools and equipment returned to warehouse	
2.	Unused materials returned	
3.	Trailers and support items removed	

D. Warranty Initiation		
1.	Owner notified of warranty period in writing	
2.	Warranty coverage outlined in letter	

E. Operation and Maintenance Manuals completed including:		
1.	Copy of valve tag lists	
2.	Phone numbers of company service department regular and emergency numbers	
3.	Phone numbers of major equipment suppliers	
4.	Testing and balance reports	
5.	Warranty letter and description of items covered under warranty	
6.	Parts lists on major items	
7.	Schematic diagrams, flow charts of systems and control circuits	
8.	Vendor list including item and original purchase order numbers, Model and Serial numbers	
9.	Manufacturer Operation and Maintenance Manuals	

F. Final Invoice plus retainage submitted	

G. Letter of completion submitted	

H. Letters of appreciation and recognition sent	

Figure 43-1 Job Completion Checklist (Sheet 2 of 2)

JOB COMPLETION CHECKLIST

Date			Job Number	

Job Name

ITEM	CHECK WHEN COMPLETED

A. Company preliminary punch list		
1.	Panel & Disconnect tags installed	
2.	Panel schedules installed	
3.	Testing of branch circuits complete	
4.	Fire Alarm check out	
5.	Proper rotations of mechanical equipment checked	
6.	Equipment tags	
7.	Utilities energized	
8.	Fire stopping	
9.	Touch up painting completed	
10.	Spare parts signed for	
11.	Clean fixtures and lamps	
12.	Housekeeping completed	
13.	Start up completed	
14.	Factory start up personnel scheduled	
15.	Instructions to owner complete	
16.	As-built drawings completed	
17.	Testing completed, reports issued	

B. Punch List		
1.	Completion date established	
2.	Copies turned over to subcontractor and company personnel	
3.	All items checked	
4.	Proper authority notified of completion	

Figure 43-2 Job Completion Checklist (Sheet 1 of 2)

C. Demobilization		
1.	Tools and equipment returned to warehouse	
2.	Unused materials returned	
3.	Trailers and support items removed	

D. Warranty Initiation		
1.	Owner notified of warranty period in writing	
2.	Warranty coverage outlined in letter	

E. Operation and Maintenance Manuals completed including:		
1.	Phone numbers of company service department including emergency	
2.	Phone numbers of major equipment suppliers	
3.	Testing reports	
4.	Warranty letter and descriptions of items covered under warranty	
5.	Parts lists on major items	
6.	Schematic diagrams and control circuits	
7.	Manufacturer Operation and Maintenance Manuals	

F. Final Invoice plus retainage submitted	

G. Letter of completion submitted	

H. Letters of appreciation and recognition sent	

Figure 43-2 Job Completion Checklist (Sheet 1 of 2)

Mr. William Smith, Director of Facilities
XYZ Corporation
Washington, DC 20015

RE: Mechanical/Electrical Installation New Testing Laboratory

Dear Mr. Smith:

This letter is written to officially notify XYZ Corporation that the mechanical/electrical system installed by Alliance Contracting has been completed and tested and startup accomplished.

The warranty period for all defects in workmanship, including parts and labor to correct same, is from September 1, 1997 to August 31, 1998. Should you encounter any problems, please contact our 24-hour service number at 234-5678 and ask for Stan Jones, Service Manager.

We would like to point out that normal maintenance items such as changing filters, tightening belts, greasing and lubrication are not covered under warranty and are the owner's responsibility. Your Operation and Maintenance Manual, prepared by our Company, lists normal maintenance items in detail.

We will be forwarding a maintenance proposal for your consideration.

In closing, we want to express our appreciation for having been selected to install the Mechanical system for XYZ Corporation and look forward to a long association.

Sincerely yours,

Figure 43-3 Sample Notification of Warranty

CHAPTER 44 PROJECT REVIEW

NOTES

WHY BOTHER?

By the time a project is finished, everyone is usually glad to be done with it and looking forward to something new. In fact, as the project winds down, many members of the project team are already assigned to other projects.

Why, then, should you spend time reviewing the past when you already have so little time to get ready for the next project?

Paying attention to the past may save time and prevent problems in the future also. It forces everyone—the project team, the company, and the customer—to sift through the facts and see those facts objectively, apart from the pressures and confusion of budgets and schedules

Project review is where the real lessons are learned—where mistakes are tracked down and procedures are instituted to avoid repeating them. Where the accidental things that turned out right can be incorporated into policies that improve the profitability of everything the company does.

Project reviews are most beneficial when they are fully integrated into your company's Total Quality Management program. The TQM program is the system that spreads the word throughout your company, resulting in continuous improvement of all projects. TQM is also the system that keeps your company standards up-to-date and continuously improves systems and procedures to increase efficiency and quality of all your projects.

OBJECTIVES

Project review has six objectives:

- Identify project successes and failures, and their causes
- Analyze the effectiveness of the project's management, communication, and relationships
- Refine strategies for planning and running future projects,
- Open opportunities for future work
- Provide a basis for continuous improvement through participation in your company's TQM program, and
- Identify successes and pass along congratulations to the participants

TWO TYPES OF REVIEW

Project review is a two-part process. The first is an in-house review by the project team and other people in the company. The second is a review by the project manager and the customers.

PROJECT TEAM REVIEW

The purpose of the project team review is to give the company's personnel an opportunity to review and assess its performance and clear up any loose ends that remain.

Participants

Depending on the size and complexity of the project and the structure of your company, the participants in an in-house project review should include:

- Company president or CEO
- Chief project manager or operations manager
- Project manager
- Chief estimator
- Project estimator
- Job superintendent
- Job foremen

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- Purchasing agent
- Drafting manager
- Fabrication shop foreman
- Material handling coordinator
- Sales personnel
- Office manager, and
- Accountant.

Agenda

The project manager should prepare and distribute a well-organized meeting agenda to all participants well ahead of the day of the meeting. It should include:

- Date, time, and location of meeting, and
- Outline topics of discussion.

The Pre-planning Meeting Checklist found in the "Pre-planning Meeting" (see Chapter 7) section of this manual is a useful basis for a review meeting agenda, since it covers all areas of the project.

Company management should encourage all project team members and involved company personnel to attend and make a point of arranging their schedules to allow this. Management should also encourage everyone to prepare for the meeting by reviewing the agenda and gathering whatever information and suggestions they wish to present.

Conducting the Meeting

In conducting the meeting, the project manager has to establish an atmosphere that allows the project team to meet the objectives of the review. To do this:

- Encourage frank, open discussion
- Emphasize importance of team spirit in analyzing project
- Welcome all constructive criticism
- Avoid finger-pointing and scapegoating, and
- Do not permit polarization or domination of the meeting among factions or individuals.

Also make sure that what the project team discusses and decides is accurately and completely recorded and later distributed so that it can be used in company planning and in preparation for the review meeting with the customer.

Sample Questions for Consideration

Among the questions that can help guide discussion and analysis of the project are the following:

- How did final costs compare to estimated costs?
- What major assumptions were used in estimating the job? Were they accurate?
- What major variances occurred? What caused them?
- How did labor productivity compare to the estimate?
- What factors influencing labor productivity should be considered in future planning?
- Did the project follow the original schedule?
- How good were company relations with:
  - Project owner
  - Design professionals
  - General contractor
  - Subcontractors
  - Other trades on job
  - Suppliers and manufacturers
- How well did the general contractor treat the company in terms of:
  - Scheduling

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  - Payment
  - Coordination with other trades
  - Material handling facilities
  - Change orders
  - Safety
  - Back charges
  - Other
- Did the project team follow through with goals and procedures established in pre-planning, particularly those for:
  - Prefabrication
  - Material handling
  - Shop drawings
- What were the project team's overall strengths?
- What would the project team do differently on future projects?

Follow-up

Following the in-house review, make sure you:

- Distribute copies of minutes to all attendees
- Use the minutes to prepare for the review meeting with the customer(s), and
- Formulate a summary of the key lessons learned and your recommendations, so that the CEO and the operations manager can incorporate the findings of the review into the company's policies and procedures, as appropriate.

PROJECT REVIEW WITH CUSTOMERS

Among the objectives of reviewing the job with the customers are to:

- Give the customers an opportunity to review and assess the company's performance
- Obtain feedback on the company's performance
- Demonstrates company's interest in the customers' satisfaction
- Maintain or repair customer relations, and
- Clearly state the company's interest in doing future work for the customers.

Normally the project team has more than one customer on the project. In addition to the project owner, there is the design engineer or architect and the construction manager or general contractor. The owner, his design professionals, and his construction manager (if any) are really one customer. The general contractor, however, is a separate entity, and the project team should plan a separate review meeting with him.

All review meetings with out-of-house companies or individuals should be high-level executive-to-executive summit meetings. This means that the specialty construction company's president or CEO should accompany the project manager. Other members of the project team should be included only if the agenda demands it.

Agenda

In proposing a review meeting, you should clearly state in writing:

- The purpose of the meeting and
- Your recommendations for who should attend.

Emphasize that the meeting will be a frank and open discussion of the project and a forum for exploring ways for the company to improve the quality of its service. If the meeting is with the general contractor, encourage him to invite his job superintendent and chief inspector. A project owner should be asked to invite his architect or engineer and construction manager. Plan to take notes at the meeting.

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Conducting the Meeting

As with the in-house review, here you should establish an atmosphere that is conducive to real progress and direct the discussion so that it touches on all important points. Do this by:

- Inviting the customer to be frank in his criticisms and comments and clear the air of any concealed problems or dissatisfaction
- Requesting recommendations for avoiding the types of problems that may have occurred on the project, and
- Asking for the customer's comments on the performance weaknesses identified by the project team in its review.

Use a checklist of general topics to make sure that nothing is overlooked. Among the topics:

- Shop drawing presentation
- Submittal data processing
- Change orders (pricing and presentation)
- Cooperation on the job site
- Correspondence (adequacy, clarity, tone)
- Scheduling
- Safety
- Quality control
- Operation and maintenance manuals
- Clean up
- Punch list completion
- Job close-out
- Warranties and guarantees, and
- Other.

When you have finished discussing the project, express your company's interest in doing future work for the customer. Request information on available opportunities for construction or service work and review the company's capabilities, experience, facilities, and personnel.

Finally, thank the customer for:

- The opportunity to work on project
- His assistance in reviewing the project, and
- His consideration of the company for future work.

Follow-up

Immediately following the review meeting, send a letter of thanks to customer. Distribute pertinent notes from the meeting other members of the project team and help management to incorporate the customer's suggestions, as appropriate, into its policies and procedures.

CONCLUSION

A company's growth and improvement rely on learning from its successes and mistakes. Project review makes that learning possible. By showing its interest in learning, the company also demonstrates to its customers that it is a professional organization which is serious about offering the best possible service. This type of demonstration is sometimes enough to earn the company a second opportunity to prove itself, even after a project that is less than completely successful.